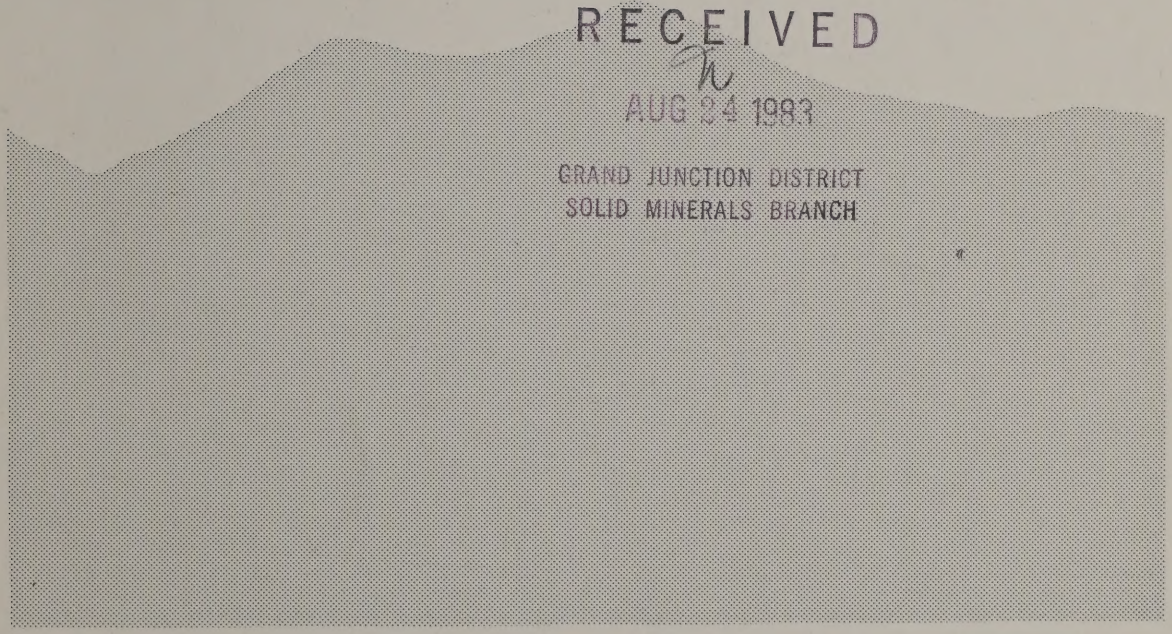
DRAFT

Red Mountain

ALUNITE MINING PROPOSAL

Environmental Assessment



U. S. D. I.
Bureau of Land Management
Montrose District
June 1983

IN REPLY REFER TO

1792
C-11418

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Montrose District Office
2465 South Townsend
P.O. Box 1269
Montrose, Colorado 81402

NOTICE

Enclosed for your review and comment is the Draft Environmental Assessment (EA) for the Preference Right Lease Application (PRLA) submitted by Earth Sciences, Inc., for a deposit of the mineral alunite located on public lands administered by the Bureau of Land Management. The EA was prepared under the provisions of the National Environmental Policy Act, and is now ready for public review.

A public meeting to be held in Lake City, Colorado, is scheduled for late August of 1983. The exact time, date, and place will be published prior to the meeting.

Written comments are encouraged and will be particularly useful in decision-making if they are specific to the content of the Draft EA and the issues and impacts discussed in this document. All comments must be received by September 1, 1983.

Attachment A illustrates the background and sequence of events necessary for this proposal.

Thank you for taking the time to help us. If you have any questions, please contact Gene Vecchia at (303) 249-6624.

Written comments should be submitted to:

Mr. Terry A. Reed
Gunnison Basin Resource Area
Bureau of Land Management
P.O. Box 1269
Montrose, Colorado 81402

Robert S. Schmidt
Acting District Manager

RED MOUNTAIN

ALUNITE MINING PROPOSAL
ENVIRONMENTAL ASSESMENT

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MONTROSE DISTRICT

June 1983

LEASING PROCESS AND BACKGROUND

1973/1980 Management Framework Plan (MFP)	Restricted exploration, "primitive" area management, re-evaluate if economic deposit found
1974 Prospecting Permit	"Stipulation 1" Lease issued only if ore can be extracted without significant adverse effect
1976-78 Exploration Work	Three "helicopter" holes
1979 Initial Showing	Discovery of a valuable deposit and general proposal for development
1982 Addendum to Initial Showing	More specific development proposals for EA Company proposal
1983 Environmental Assessment (EA)	Stage I EA to address Stipulation 1 - DRAFT Advisory Council Comment Period Public Meeting
1983 Decision	No significant adverse effect; proceed to EIS Significant adverse effects; deny lease
EIS	Analyze entire proposal including transportation and mill Develop lease stipulations
Final Showing	Company proposal to meet stipulations Show valuable deposit and meet "prudent man" principle

RED MOUNTAIN

ALUNITE MINING PROPOSAL
ENVIRONMENTAL ASSESMENT

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MONTROSE DISTRICT

June 1983

LEASING PROCESS AND BACKGROUND (continued)

Lease Issued	Including stipulations and conditions Wilderness Study Area question
Mining Plan	Detailed development plan Many other permits
EA	Analyzing detailed proposals of Mining Plan
Mine Plan Approval	Including any other more detailed conditions to meet regulations

RED MOUNTAIN

ALUNITE MINING PROPOSAL
ENVIRONMENTAL ASSESMENT

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MONTROSE DISTRICT

June 1983

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I. Purpose and Need

Earth Science, Inc. has applied for a preference right lease of 1,667 acres of public land for the purpose of developing a deposit of alunite (potassium aluminum sulfate). The area of the lease application is located in sections 17, 18, 19, and 20, Township 43 North, Range 4 West, N.M.P.M., and is situated in Hinsdale County approximately three miles south of Lake City, Colorado. See maps 1 and 2.

This environmental assessment addresses and analyzes the proposal by Earth Sciences, Inc. to mine the mineral deposit and also addresses reasonable alternatives to their proposal. This is a document that officials will use in the decision-making process regarding whether the lease should be issued or not and if so, under what conditions.

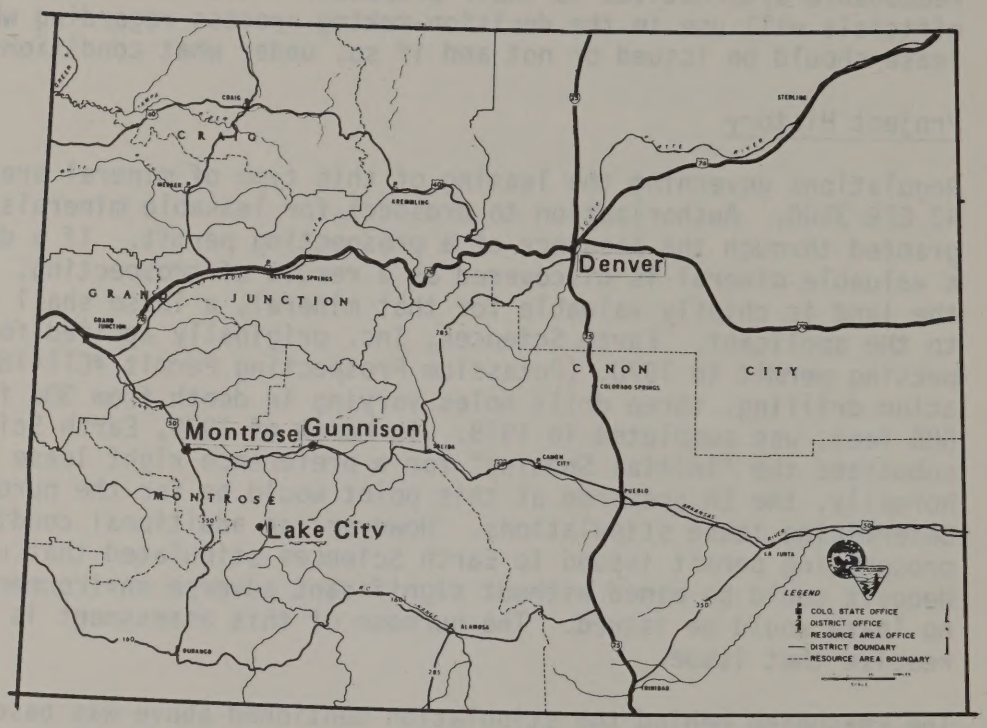
Project History

Regulations governing the leasing of this type of mineral are found in 43 CFR 3500. Authorization to prospect for leasable minerals is granted through the issuance of a prospecting permit. If a deposit of a valuable mineral is discovered as a result of prospecting, and if the land is chiefly valuable for that mineral, a lease shall be issued to the applicant. Earth Sciences, Inc. originally applied for a prospecting permit in 1970, (Potassium Prospecting Permit #C11418). Exploration drilling, three drill holes varying in depth from 306 feet to 688 feet, was completed in 1978. In March of 1979, Earth Science, Inc. submitted the "Initial Showing" for a preference right lease application. Normally, the EA prepared at this point would be for the purpose of determining lease stipulations. However, an additional condition in the prospecting permit issued to Earth Sciences stipulated that unless the deposit could be mined without significant adverse environmental effects, no lease would be issued. The purpose of this assessment is to try to resolve that issue.

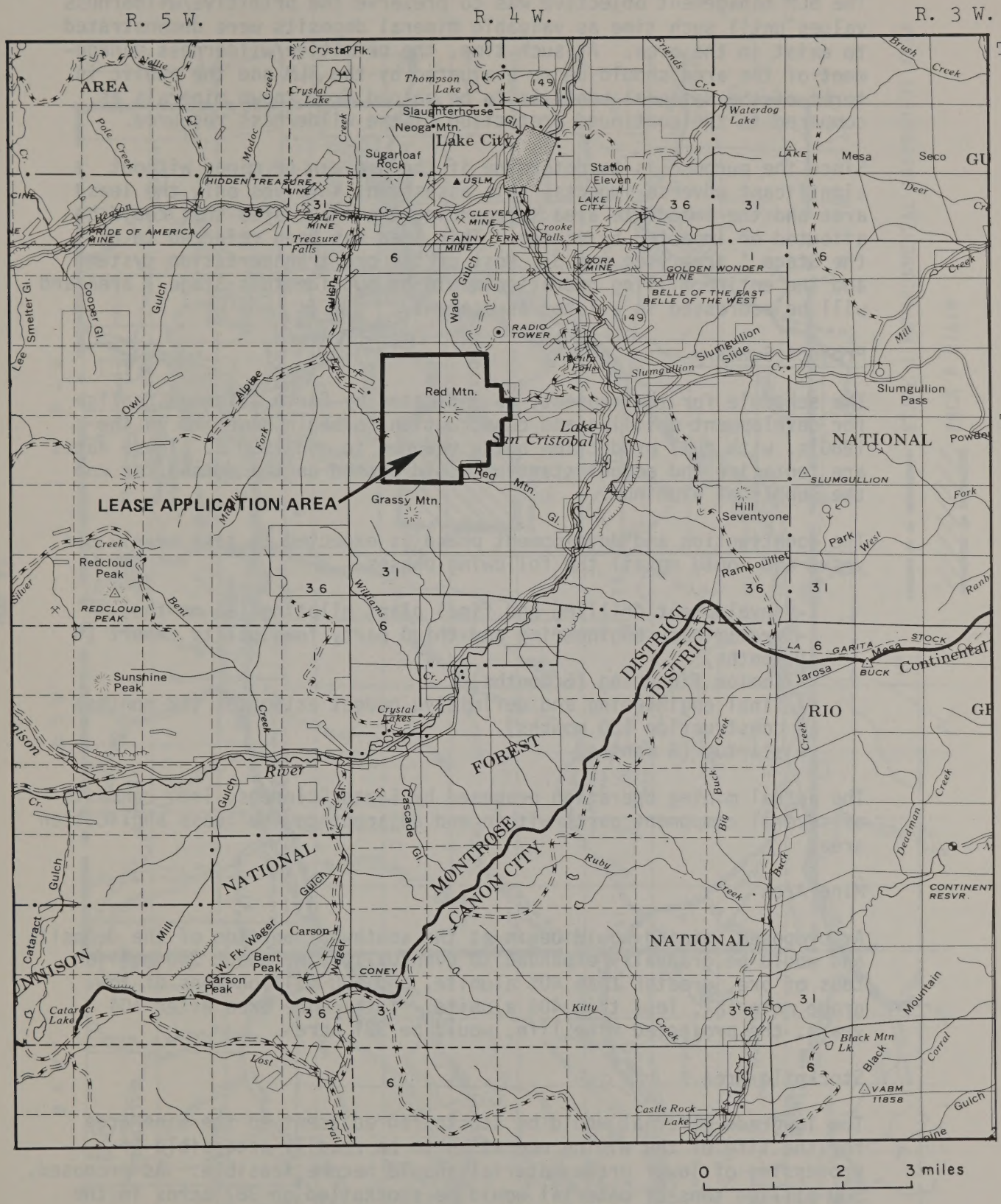
The reasoning behind the stipulation mentioned above was based on guidance from the American Flats Management Framework Plan, completed in 1973. This land use plan was developed with considerable public involvement and with specific involvement of an advisory panel who were well aware of and who gave considerable indepth thought to both the high primitive/wilderness values and the high potential mineral values of the Red Mountain Area

At the time when the prospecting permit was issued, the potential for primitive/wilderness values was fairly obvious but the value of the area for minerals, specifically alunite, was speculative and uncertain. With this in mind, decisions that were made placed special emphasis on the protection of the primitive/wilderness values. In order to not sacrifice these values unnecessarily, exploration work was restricted to aircraft, foot, or horseback. The exploration work carried out by Earth Sciences, Inc. in 1976, was conducted using a helicopter.

COLORADO



Map 1. General Location Map



Map #2. SITE LOCATION MAP

The BLM management objective was to preserve the primitive/wilderness values until such time as valuable mineral deposits were demonstrated to exist in the area. At such time, the primitive/wilderness management of the area should be re-evaluated by the BLM and the public in terms of the National benefits to be gained from known minerals as compared to the continued protection of the wilderness resource.

Since the purpose is to determine if the ore can be mined without significant adverse impacts, this assessment involves only the lease area and the immediate area surrounding the lease area that could be affected or impacted by mining. This area has been referred to as the Stage I area (see map 3). Most of the ore transportation system and the entire milling operation would be outside this Stage I area and will be addressed in a later assessment.

Project Summary

The schedule for the project, as indicated by Earth Sciences, calls for development drilling and construction to begin sometime in the 1980's, with full production being reached in mid 1990's. These dates are tentative and actual start-up would depend on the demand for and the supply of aluminum.

The construction and development phase is expected to take nearly six years and would entail the following phases.

- development drilling and final plant piloting (12 months)
- preliminary engineering and third party feasibility report (6 months)
- senior financing (6 months)
- final engineering and definitive budget estimates (12 months)
- construction (30 months)
- startup (6 months)

The actual mining operation proposed by Earth Sciences, Inc. consists of several component parts within and adjacent to the lease application area.

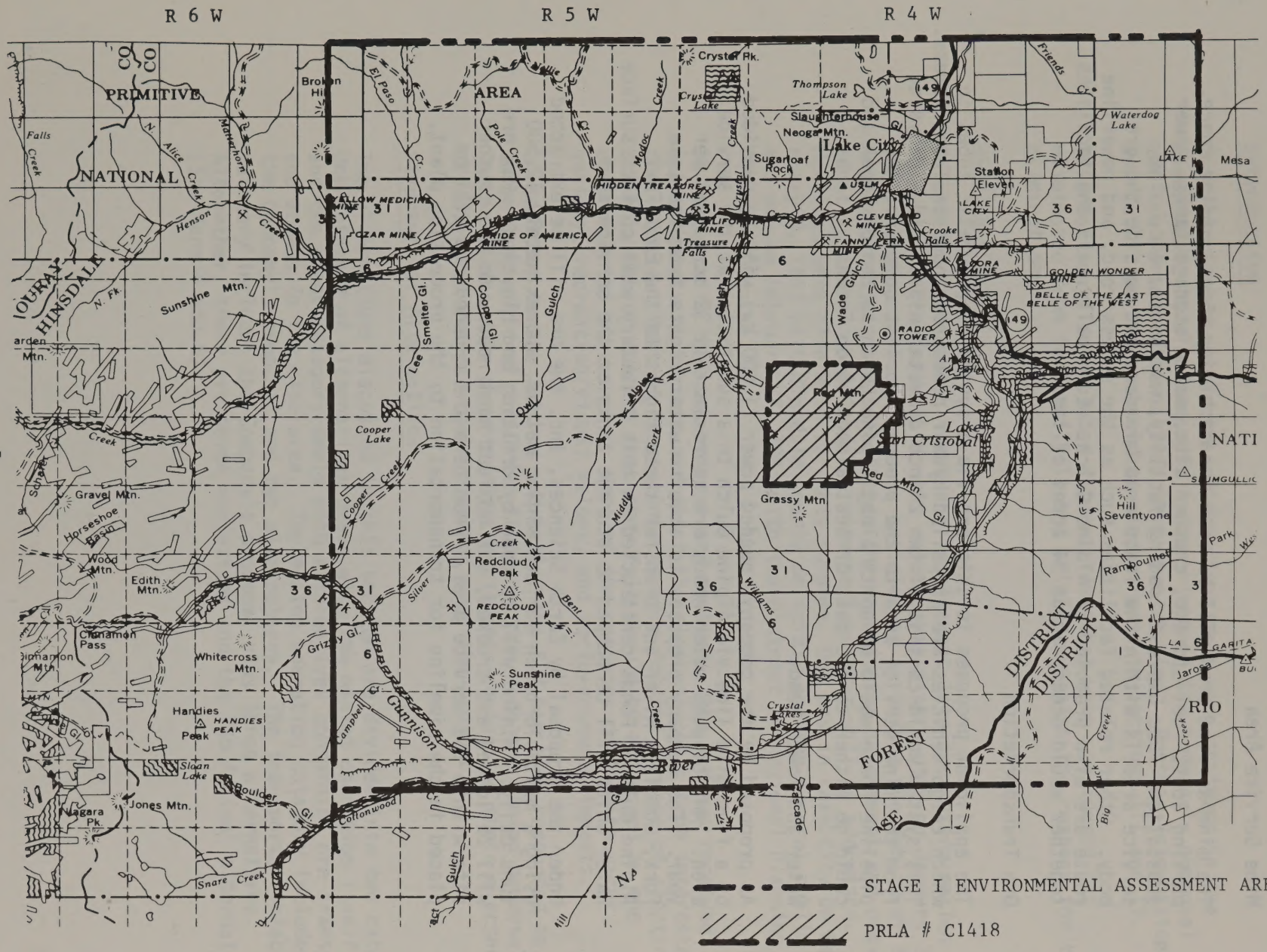
Mine Area

As proposed, mining would begin at the southwest portion of the deposit and would be gradually expanded to eventually mine about 350 million tons of ore, greater than 40% alunite, and 500 million tons of low grade material, less than 40% alunite. Total mine area after 104 years, the projected mine life, would be 391 acres.

Stockpile Area

The lowgrade material would be stockpiled adjacent to the mine area for the life of the mining operation to be readily accessible if processing of lower grade material should become feasible. As proposed, 500 million tons of material would be stockpiled on 387 acres in the upper drainages of the east fork of Alpine Gulch. The majority of this stockpile area is outside the lease boundary.

MAP #3


R 6 W
R 5 W
R 4 W
T 44 N
T 43 N
T 42 N
PRIMITIVE AREA
NATIONAL
Lake City
Crystal Pk.
Crystal Lake
Thompson Lake
Slaughterhouse Gl.
Neoga Mtn.
Sugarloaf Rock
Waterdog Lake
Station Eleven
Mesa
Hidden Treasure Mine
Yellow Medicine Mine
Czar Mine
Pride of America Mine
Lifon Mine
Cleveland Mine
Fanny Perry Mine
Crooke Falls
Treasure Falls
Dora Mine
Golden Wonder Mine
Belle of the East
Belle of the West
Radio Tower
Sunshine Mtn.
Cooper Gl.
Smelter Gl.
Lee Gulch
Owl Gulch
Wade Gulch
Cooper Lake
Cooper Creek
Middle Fork
Red Mtn.
Red Mtn. Gl.
Lake San Cristobal
Grassy Mtn
Gravel Mtn.
Horseshoe Basin
Wood Mtn.
Edith Mtn.
Redcloud Peak
Silver Fork
Bent Creek
Williams Creek
Hill Seventyone
Rampoulher
Cinnamon Pass
Cinnamon Mtn.
Whitecross Mtn.
Sunshine Peak
Handies Peak
Campbell Gl.
Grizzly Gl.
Gunnison River
Crystal Lakes
Sloan Lake
Boulder Gl.
Jones Mtn.
Niagara Pk.
Collonwood Gulch
Snare Creek
Cascade Creek
Big Creek
Jarosa
RIO GARITA
DISTRICT
FOREST
STAGE I ENVIRONMENTAL ASSESSMENT AREA
PRLA # C1418

Mine Service Area

The mine service area will be used for machinery shops, office space, parking lots, fuel storage, crusher site, water storage tanks, power substation, Tube Express loading facility, warehouse, etc. The service area is within the lease area boundary but outside the ore body. Other related facilities such as the access road, and powerline route are also proposed in Alpine Gulch. Eventually, all the facilites together would occupy about 34 acres of land.

Ore Transportation

The applicant proposes to ship ore via a system of pneumatic tubes in which cargo vehicles are propelled by air pressure, known as Tube Express. This system would consist of two 24inch diameter pipes laid sidebyside from the mine service area to the processing plant complex. The pipeline route would be north along Alpine Gulch to Henson Creek and could go either to the east or west along Henson Creek.

Water and Power Needs

As proposed by the company, needed power (1,000 kw) will be provided by a five mile line via Alpine Gulch to a substation at the service area. Anticipated water needs are approximately 32 acre feet per year. The company proposes to acquire water rights from the Lake Fork, Gunnison River and transfer these rights to the East Fork, Alpine Gulch. Ponds constructed on this tributary will collect surface water which will be pumped to storage tanks at the service area.

Under the proposal by Earth Sciences, Inc. the ore will be extracted using a multiple bench surface mining method, approximately 12,500 tons daily. Mining will be done by drilling and blasting. Raw ore will be loaded and trucked, via 60 feet haul roads, to the crusher site within the service area. From here the crushed ore will be placed in the pipeline for transportation to the processing plant.

II. Alternatives Including the Preferred Alternative

Introduction

This section describes the alternatives that were analyzed in the assessment. It also presents a comparison of the Company's proposal and the various alternatives that were studied. Further information and detail on the comparisons can be found in Sections III and IV.

This section also includes alternatives that were considered but eliminated from full analysis and briefly explains the reasons for the eliminations.

Scoping Process

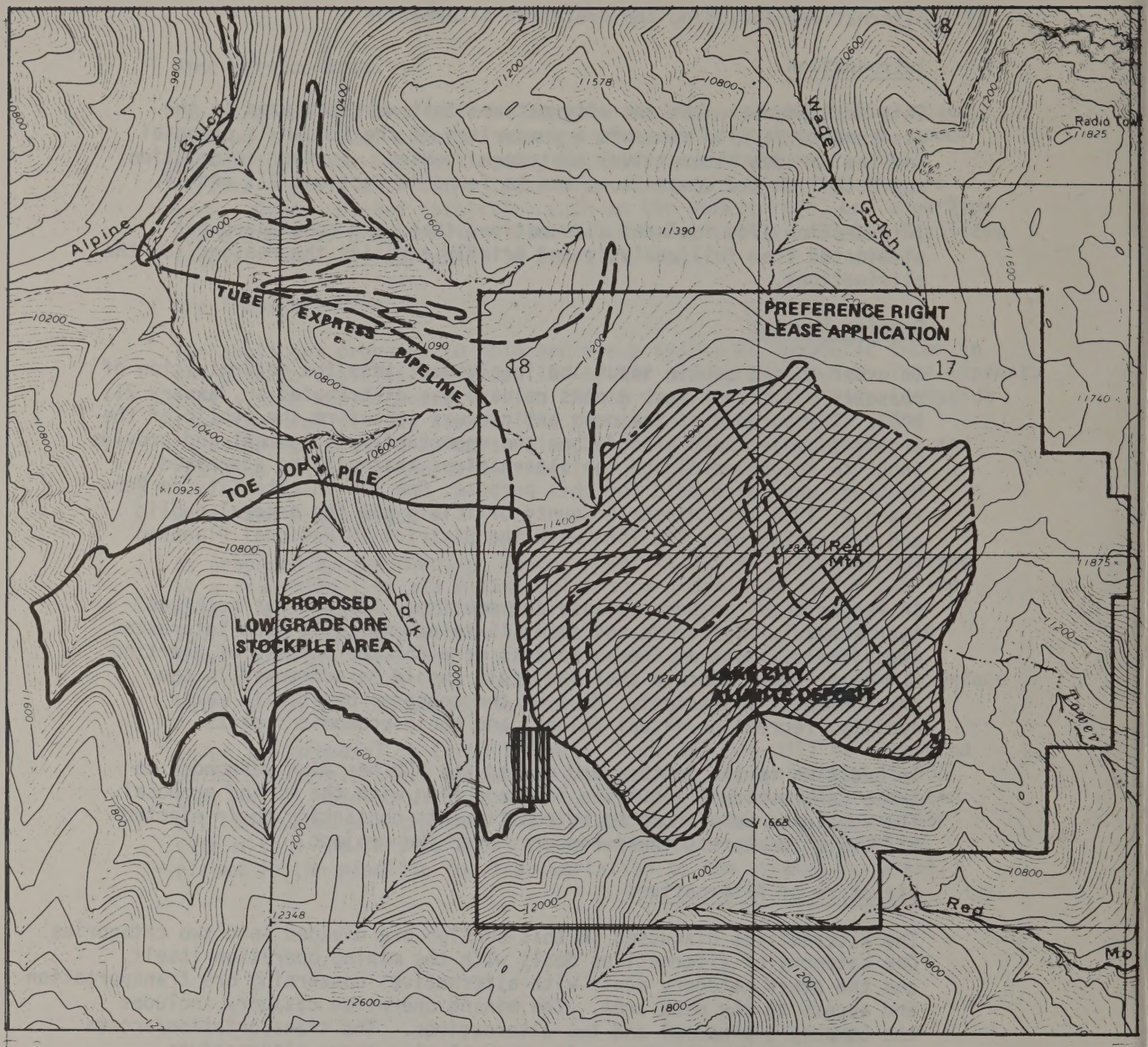
In order to get public input and involvement into the determination of reasonable alternatives, a news release was distributed on January 21, 1983. The purpose of the news article was to inform the public of the proposed project and afford them the opportunity to comment and provide input to the proposal and the alternatives that will be addressed. Meetings were also held for this purpose. One was in Lake City on February 8, 1983 with Hinsdale County officials and the general public and one on February 17, 1983 with the District 10 Regional Planning Commission.

In response to the news release and meetings, the BLM has received approximately 75 letters and about 15 telephone calls from interested individuals. Most of these contacts were for the purpose of alerting BLM to areas of concern that they felt should be addressed in the environmental assessment. Most of the concerns dealt with water quality, recreation/visual values, and socio-economic impacts.

In addition to the letters and calls, the BLM has also responded to three Congressional inquiries in connection with the mining proposal. The inquiries were prompted by constituants contacting their elected officials to express their concerns over the project.

Structure of Alternatives

The alternatives discussed in this section are divided into two catagories. One catagory of alternatives deals with the mining operation itself, and the other catagory deals with alternatives concerning ore transportation and access to the mine area. The mining operation catagory includes the Company's proposal and two alternatives. The transportation/access catagory includes the Company's proposal plus three alternatives. Altogether, there are seven variations and the "No Action" alternative. (See Maps 4 and 5)



LEGEND

——ACCESS ROAD

– – –PRIMARY HAUL ROAD

——·——NORTHEAST EDGE OF MINING OPERATION AS PROPOSED

ALUNITE DEPOSIT

MINE SERVICE AREA

MAP 4. COMPANY'S DEVELOPMENT PLAN FOR THE LAKE CITY DEPOSIT

LEGEND

1. Possible location of rail head
2. Possible location of tram
3. Possible location of haul road
4. Possible location of the Wade Gulch access road
5. Possible location of the Red Mountain Gulch access road

Lines show approximate locations only; final locations would depend entirely on engineering studies.

Map 5. ORE TRANSPORTATION AND ACCESS ALTERNATIVES

Description of Alternatives

A. Company Mining Proposal - The Company proposes to extract the ore using a multiple bench surface mining method. They propose to mine the deposit southwest of Red Mountain first. At their proposed rate, this is estimated to take approximately 100 years. At the end of that period, the determination will be made as to whether or not to mine the remainder of the deposit, northeast of Red Mountain. Average daily production would be in the range of 12,500 tons of ore. Only ore grading 40% of alunite or greater will be shipped to the processing plant. Lower grade ore will be stockpiled outside the lease area along upper East Fork, Alpine Gulch. The stockpile area will eventually encompass about 387 acres, and it is anticipated to remain there permanently.

As the Company proposes it, 150 workers will be employed during the construction period, and this figure will drop to approximately 70 permanent employees under normal production.

B. Strip Mine Alternative - This alternative to the proposed action would be a strip mining, backfill method for extracting ore. Under this alternative, low grade ore would be placed back in the mined out trenches, thus eliminating the need for the stockpile area. The lease area would be mined in the same manner as proposed by the Company, i.e. the portion of the deposit southwest of Red Mountain first and eventually (possibly 100 years) the portion of the deposit lying northeast of Red Mountain. Under this alternative, it is assumed that eventually the entire ore deposit within the lease area will be mined. Employment needs in this alternative are anticipated to be the same as in the proposed action, (i.e. 150 during construction and 70 employees in the normal operation).

C. Accelerated Production Alternative - the mining method in this alternative would consist of a multiple bench or open pit type but the entire surface of the deposit would be mined at the same rate. In other words, the portion southwest of Red Mountain would not necessarily be mined prior to beginning work on the portion northeast of Red Mountain. Under this alternative, as in the previous one, there would be no stockpile area. All low grade ore would be transported off the lease area and out of the Stage I study area. It would either be stockpiled at the processing plant site or someplace along the route to the plant.

Another major difference in this alternative is that the production rate would be doubled. Instead of processing in the neighborhood of 12,500 tons of ore/day, the rate would be approximately 25,000 tons/day. This alternative would require more employees during full production but probably about the same number of workers during the construction period. It is estimated that about 105 employees will be required to run the full production operation, as compared to 70 employees in the two previous proposals. The duration of the life of the project would be greatly reduced under this alternative.

D. Company's Transportation/Access Proposal - The Company proposes to transport crushed ore from the mine service area via two 24-inch Tube Express pipelines. They propose these pipelines to be above ground. From the mine area this tube express will follow Alpine Gulch to the Henson Creek road, then go either up Henson Creek to the west boundary of the Study area or down Henson Creek through or around the edge of Lake City, then follow the Lake Fork Gunnison River.

In the Company proposal, access to the mine will be by an improved road, seven miles long, up Alpine Gulch to the mine area. Needed power and telephone lines are assumed to go in Alpine Gulch, essentially the same route as the access road.

E. Alpine Gulch Haul Road Alternative - Instead of a tube express system as proposed for shipping ore, this alternative involves a railroad and the use of trucks for hauling ore to the railhead. The railhead would be located along the Lake Fork, Gunnison River, within one mile to several miles north of Lake City. This alternative would require construction of a haul road (approximately 40-50 feet wide) up the Alpine Gulch drainage to the mine service area. It is assumed that this haul road would follow essentially the same route as the access road proposed in Alpine Gulch, by the Company. Ore would be hauled, by trucks, from the service area down the haul road to Henson Creek, then down the Henson Creek road around the west side of Lake City to the railhead. This alternative would eliminate the need for the proposed access road since the haul road would fit that need. Power and telephone lines would follow along the haul road to the service area.

F. Wade Gulch Access Alternative - This alternative involves having the access road to the mine area located in the Wade Gulch drainage. Topography in this area is not suitable for haul road purposes so under this alternative, ore would be transported from the mine area either by the proposed Tube Express in Alpine Gulch or by use of a conveyor. The conveyor would extend from the mine area around or over the east side of Lake City to a railhead along the Lake Fork. This alternative assumes that the existing road servicing the radio tower and beyond would be used but additional road would need to be constructed. Two routes for extending the existing road are possible. One location would be from the existing road around the north side of Red Mountain. The other would be from the end of the existing trail around the south side of Red Mountain. Assumed under this alternative is that portions of the existing road would have to be reconstructed and needed power and telephone lines would accompany this access road.

G. Red Mountain Gulch Access Alternative - This is another alternative involving only access to the mine area. In this alternative the access road would be located in the Red Mountain Gulch drainage. Here, as in the previous alternative, the topography does not lend itself to the construction of a haul road so ore would need to be transported by "tube express", tram, or conveyor as described in the Company's Proposal and in The Wade Gulch Access Alternative. Also in this case, an existing road, part way up Red Mountain Gulch,

would be used following reconstruction and/or realignment work. From the end of this existing road a new section of access road would need to be built to the mine area. Topography is steep, considerable switch-backing in the route would be necessary. Since this access point is a considerable distance from Lake City, it is assumed that the needed power and telephone lines would not accompany this access route. Instead they would be in either the Alpine Gulch drainage or the Wade Gulch drainage.

H. No Action Alternative - This alternative assumes that the proposal by Earth Science, Inc. is never developed and that the area remains as it now is.

Alternatives Considered But Eliminated From Further Study

Underground Mining

Underground mining techniques are generally applicable to ore occuring in veins or ore bodies having considerable overburden. Neither of these conditions exist at the Red Mountain deposit. Good mining practice would indicate that the best method of removing the alunite ore would be by surface mining techniques.

Truck Transportation

Truck haulage of the quantity of material being considered for a distance of over 80 miles is not reasonable. It would involve 250 fifty-ton truckloads of material per day, and assuming round-the-clock hauling, would mean one truckload every 6 minutes. The logistics of this scenario are ridiculous, without even considering the economics.

BLM Preferred Alternative

The Bureau of Land Management preferred alternative is a combination of several of the alternatives considered in the assessment. It is preferred because it presents the least amount of impacts to the majority of the resource values analyzed.

Preferred Mining Method: Originally the Bureaus' preferred alternative for mining was the Companys' proposal excluding the stockpile area and excluding mining of the Northeast portion of the ore deposit on Red Mountain. In place of the stockpile, the low grade ore was to be transported off the site or placed back in the mined out area. After consultation with the Montrose District Advisory Council, this preferred alternative was altered somewhat. It is now preferred that all low grade ore be transported off-site, eliminating the option of placing the low grade material back into the mined out areas. It was felt that material placed back into the mine area could increase the risk of water quality contamination.

Preferred Transportation/Access: The preferred alternative for ore transportation and access is the Wade Gulch route, both for road access and for location of the Tube Express to transport ore.

Table II-1

COMPARATIVE ANALYSIS OF IMPACTS FOR THE ALTERNATIVES

Alternative	Mineral Resources	Soils and Vegetation	Water Resources	Climate and Air Quality	Terrestrial Wildlife	Aquatic Wildlife
Company's Mining Proposal Alternative	4 million tons of ore annually. 100+ years mine life.	450 acres soil loss. Loss of aspen, spruce forest. Production of 4 MMBF timber.	Possible decrease in annual water yield in Alpine Gulch. Possible increased acidity and decreased water quality of Lake City water supply. Closure of water system in worst case.	Moderate reduction of air quality from dust and exhaust	Displacement of 450 deer and 100 elk from summer range. Loss of habitat for other animals.	Possible loss of aquatic and riparian habitat in Alpine and Henson Creeks due to decrease in water quality.
Strip Mine Alternative	4 million tons of ore annually. 50+ years mine life. About 50% of ore not mined.	85 acres soil loss. Loss of aspen, spruce, grassland meadows. Production of 1 million BF timber.	Essentially the same as above, but no impact from stockpile	Significant reduction of air quality.	Displacement of 20 deer and 30 elk from summer range. Loss of habitat less than above.	Similar to company proposal but lower magnitude of impacts.
Accelerated Production Alternative	8 million tons of ore annually. More rapid depletion of reserves.	91 acres soil loss. Vegetation loss same as stripmine proposal. Timber Production same as stripmine alternative	Same as Company Mining Proposal, but no impacts from stockpile	Same as stripmine proposal	Same as stripmine alternative Loss of habitat for other animals.	Similar to company proposal; shorter duration of impacts, but more severe.

Table II-1

COMPARATIVE ANALYSIS OF IMPACTS FOR THE ALTERNATIVES

Socio-Economics	Wilderness	Recreation	Noise	Visual Resources
Population: 29% increase above baseline School-age population: 50% increase above baseline Employment: 39% increase above baseline Per capita income: 19% increase above baseline. Considerable expansion of facilities and services. Potential funding problems. Potential decrease in tourism and part-time resident population. In the event of mine shutdown, substantial loss of population, employment, per capita income.	7000 acres not suitable for wilderness designation. Opportunities for solitude reduced substantially in surrounding area.	Some displacement of visitor use. Major impact to primitive type use. Change in opportunity settings from SPNM to SPM or RN.	Noise level within mine area affecting about 2900 acres. Effects on wildlife and recreationists.	Immediate visual impacts to views from the south. Night lights visible. Does not conform to VRM Class II designation.
Essentially the same as above.	Same as above.	Same as above	Same noise level as above, slightly smaller area affected.	Essentially the same as above.
Population: 44% increase above baseline School-age populaton: 77% increase above baseline. Employment: 59% increase above baseline Per Capita Income: 25% increase above baseline Other impacts similar to Company Proposal, but greater magnitude.	Same as above	Same as above	Similar impacts to Company Mine Proposal	Similar to Company Mine Proposal, but impacts more readily noticeable from north as well as south viewing areas.

Table II-1

COMPARATIVE ANALYSIS OF IMPACTS FOR THE ALTERNATIVES

Alternative	Mineral Resources	Soils and Vegetation	Water Resources	Climate and Air Quality	Terrestrial Wildlife	Aquatic Wildlife
Company's Access and Transportation Proposal Alternative	No effect.	34 acres soil disturbance Aspen, spruce,	Short-term increased sediment in Alpine Gulch during construction	Negligible	Displacement of 30 deer and 45 elk from summer range. Loss of 36 acres of non-game habitat 500 acres degraded due to noise and dust.	Short-term impacts during construction. Long-term impacts from loss of habitat due to channelization of Alpine Gulch and road use.
Alpine Gulch Haul Road Alternative	No effect	59 acres soil disturbance Loss of aspen and spruce	Increase in sediment yield. Possible contamination from fuel or chemical spills.	Some reduction in air quality locally from increased dust.	Displacement of 30 deer and 45 elk from summer range. Loss of 61 acres of non-game habitat. 600 acres degraded.	Similar to above, but impacts approximately doubled in severity.
Wade Gulch Access Alternative	No effect.	34 acres soil disturbance Loss of aspen and spruce	Similar to Company Access Proposal, but less severe	Mimimal	Displacement of 15 deer and 15 elk from summer range.	Short-term impacts to aquatic inverte-brates during construction.
Red Mountain Gulch Access Alternative	No effect	40 acres soil disturbance loss of aspen and spruce	Similar to company access proposal	Minimal	Displacement of 20 deer and 30 elk from summer range.	Minimal impact

Table II-1

COMPARATIVE ANALYSIS OF IMPACTS FOR THE ALTERNATIVES

Socio-Economics	Wilderness	Recreation	Noise	Visual Resources
No Impact	In conjunction with mining, same as Company's Mining Proposal	Elimination of primitive trail in Alpine Gulch. Elimination of primitive and semi-primitive non-motorized recreation opportunity settings.	Increased noise level within 400 feet of source.	Impacts limited to Alpine and Henson Creeks, somewhat mitigated by topography.
No Impact	Same as above	Same as above; greater safety hazard to recreationists.	Increased noise level within 800 feet of source.	Impacts difficult to integrate with landscape.
No Impact	In conjunction with mine, 4500 acres not suitable for wilderness.	Essentially the same as Company Access Proposal, but trail not eliminated.	Increased noise level within 800 feet of source.	Difficult to meet VRM Class II objectives. Lower portions of road highly visible.
No Impact	Same as above	Same as above	Same as above	Same as above

Table II-1

COMPARATIVE ANALYSIS OF IMPACTS FOR THE ALTERNATIVES

Alternative	Mineral Resources	Soils and Vegetation	Water Resources	Climate and Air Quality	Terrestrial Wildlife	Aquatic Wildlife
No Action	No Production	No Impact	No Impact	No Impact	No Impact	No Impact

Table II-1

COMPARATIVE ANALYSIS OF IMPACTS FOR THE ALTERNATIVES

Socio-Economics	Wilderness	Recreation	Noise	Visual Resources
For the 20-year analysis period: Population increase: 127 people Employment increase: 118 School-age population increase: 5 Per capita income increase: $2492 Expansion of facilities and services. Double the tourist and part-time resident population.	Potential designation as wilderness	No impact	No impact	No impact

III. Description of the Affected Environment

A. Lands and Access

The Preference Right Lease Application (PRLA) contains 1666.99 acres. These lands are totally unreserved, unappropriated public domain lands, administered by BLM. The lands have been surveyed under the rectangular system of public land surveys and are described as follows:

T. 43 N., R. 4 W., NMPM
Sec. 17, Lot 2, SW1/4NE1/4
S1/2NW1/4
SW1/4,W1/2SE1/4.
Sec. 18, S1/2NE1/4
SE1/4NW1/4
E1/2SW1/4,SE1/4.
Sec. 19, Lots 9, 10, 15, 16,
NE1/4, E1/2NW1/4,
E1/2SE1/4
Sec. 20, Lots 1, 2, 4, 5
W1/2NE1/4
NW1/4, W1/2SW1/4
an aggregate of 1666.99 acres.

The PRLA does not include unpatented Mineral Surveys MS9773 & MS9774 which protude into the PRLA in Sec. 19 and are bounded by Lots 9, 10, 15, 16. Approximately 2000 ft. of PRLA boundary is contiguous to private land i.e. Sec. 20 Lots 4 & 5. The PRLA boundary is also contiguous to segregated tracts 38 & 39 both of which were granted to the State of Colorado as "school sections". These lands were later reconveyed to the U.S. with a reservation of the minerals to the State of Colorado. These lands were originally described as follows:

T. 43 N., R. 4 W., NMPM
Sec. 16 NW1/4NW1/4,
NW1/4SW1/4, S1/2S1/2.

The original survey was suspended and the lands were subsequently segregated as tracts 38 & 39 in an approved protraction diagram.

The Master Title Plats show the entire area to be classified for multiple use management under C-2367, however, this classification was terminated December 15, 1981, not noted to the plat.

The lands are included in a designated Wilderness Study Area 030-208 Redcloud Peak.

Access may be gained to the PRLA by three different routes. One by county road along Henson Creek to the confluence of Alpine Gulch then by trail up Alpine Gulch to the East Fork. This route crosses a number of patented mining claims in Alpine Gulch. The U.S. does not have easements across these private lands, therefore, this route cannot be considered "Legal Access".

The second route originates on Highway 149 approximately 1/2 mile south of Lake City. This route is referred to as the Wade Gulch access and is totally on public lands. This route is approximately 4 miles to the northern PRLA boundary and is presently used as access to an authorized communication site C-26303 issued to the Forest Service. Also pending is an application by the Hinsdale County Chamber of Commerce for a communication facility at the same site. The route is an unimproved dirt road.

The third access route is referred to as the Red Mountain Gulch access. This route, approximately 7 miles to the PRLA boundary from a County Road along the Lake Fork is a primitive trail totally on public lands.

B. Geology and Mineral Resources

The lease application is located on the eastern parameter of the Lake City Caldera in the San Juan Volcanic Field. The Lake City Caldera is the most recent in a series of volcanic collapse features known as the San Juan Caldera Complex. Over a period of about 10 million years, four separate episodes of volcanic events including eruption, collapse, and resurgent doming occurred in the area between the present sites of Lake City and Silverton.

Volcanic activity in the area began about 30 million years ago with the eruption of several scattered stratovolcanoes. These early eruptions produced intermediate composition (andesitic) lavas and breccias. This was followed by a period of several million years of pyroclastic eruptions producing numerous layers of silicic ash-flow tuff. About 22.5 million years ago an elliptical block, 10 miles in diameter, began to subside, concurrent with the eruption of the Sunshine Peak Tuff. The mass of quartz latite which was emplaced along the eastern margin of this depression was accompanied by sulfuric acid-bearing hydrothermal solutions which altered the original composition of the rock to quartz alunite. At about the same time, a mass of molten material of granitic composition was causing resurgent doming of the caldera. Hydrothermal solutions associated with the granitic and latitic intrusions are thought to be responsible for the vein and replacement mineralization, both within the caldera and within the system of radial fissures on the north and east sides of the caldera. Subsequent erosion along the main drainages of Henson Creek and the Lake Fork, which circumscribe the Lake City Caldera, and their tributaries has exposed the granite porphyry core in several places. The intensely altered core of the quartz latite intrusion stands as a topographic high called Red Mountain on the eastern rim of the caldera. The color of Red Mountain as well as the color of other areas within the caldera, such as Redcloud Peak and Sunshine Peak, is due to the oxidation of iron compounds by the mineralized hydrothermal solutions, and is an indicator of the mineral potential of the area.

The exploration conducted by Earth Sciences Inc. in the lease application area provided the following estimates of ore reserves contained in the alunite deposit:

Measured Reserves	=	14 million tons
Indicated Reserves	=	41 million tons
Demonstated Reserves	=	55 million tons
Inferred Reserves	=	1.5 billion tons

The above terms for reserve classification are defined in USGS Circular 831, "Principles of a Resource/Reserve Classification for Minerals" by the U.S. Geological Survey and U S. Bureau of Mines. The cutoff grade used was 40% average alunite content.

Historically, copper, lead, zinc, silver, and gold were mined in the Lake City district from numerous, small, high-grade fissure deposits in and around the Lake City Caldera. Recent studies have indicated the potential for future discoveries of these minerals within and adjacent to the Lake City Caldera. Other minerals, such as molybdenum and uranium, which were not mined in the district historically, have been shown by geophysical and geochemical analysis to have potential occurrences in economic concentration within the caldera.

C. Soils

The soils of the proposed lease tract and contiguous area are characterized by deep, stony, subalpine soils supporting a spruce/fir forest prevalent on the lower slopes with shallow, stony, alpine soils, rock outcrop, and rubble land dominant above timberline.

The deep subalpine soils have a fair reclamation potential with large stones and low available water capacity as the limiting factors. The reclamation potential of the shallow alpine soils is poor due to shallow depths, very low available water capacity, large stones, high acidity, and the harsh physical and climatic conditions of the alpine.

D. Water Resources

The proposed lease area is located in the Gunnison River Drainage which comprises part of the Upper Colorado River Basin. On a smaller scale, Red Mountain and the surrounding area in the proposed lease is topographically high and serves as the headwaters for Wade Gulch, East Fork of Alpine Gulch, and Red Mountain Gulch. These high-mountain watersheds lie in both the alpine and subalpine zones and are characterized by spruce-fir forests at the lower elevations and mountain peaks, ridges, rock glaciers, talus slopes, and alpine meadows at the higher elevations.

The major portion of these watersheds are in the subalpine zone. Previous studies of this zone have shown that the annual water yield is approximately 45 to 55 percent of the annual precipitation (25-30 inches) with the remainder being either evaporated or transpired (Leaf 1975).

In proportion to it's area, Red Mountain Gulch can be expected to yield less runoff than either Wade Gulch or East Alpine Gulch. This can be primarily attributed to the south-trending aspect of Red Mountain Gulch (both East Alpine Gulch and Wade Gulch have north-trending aspects). The southerly aspect results in increased insolation producing higher water losses through evaporation and transpiration, a faster rate of snowmelt, and less precipitation stored as snow. Consequently, Red Mountain Gulch exhibits intermittent streamflow while both Wade Gulch and East Alpine Gulch flow perennially.

Typically, winter conditions keep the snowpack well below freezing until late March or April. Approximately one-half of the annual precipitation is stored in the area snowpacks and is released to the stream channels during the spring melting period (Leaf, 1975).

Streamflow in these drainages is comprised of surface runoff, interflow and groundwater discharge. During the spring snowmelt, all three of these processes are occurring which produces high streamflows. Low flows are generally comprised of groundwater discharge and occur from early fall to late winter.

Due to the high permeability of the soils and talus that cover most of the area, overland flow is an uncommon occurrence. This results in low sediment yields with the majority of the sediment being from channel erosion.

There is little quantified water quality data for the streams draining the lease area. Presently, the only known water quality problem area is in East Fork of Alpine Gulch. In the headwaters of this drainage there are a series of acidic groundwater seeps discharging into the stream. The acid (sulfuric acid) is a product of the oxidation of sulfides, a major component of pyrite, which is found in the local geology. The low pH water has increased the solubility of metals (i.e. iron and aluminum) found in the local rock formations, resulting in severely degraded water quality. A water quality sample collected approximately 1.5 miles upstream from the confluence of Alpine Gulch (Summer, 1982) exhibited a pH of 3.4 with iron and aluminum measuring 1370 ug/l and 2330 ug/l, respectively. The water experiences a progressive downstream increase in pH which results in aluminum sulfate and hematite forming precipitates on the substrate in the lower reaches of East Alpine Gulch and some of its tributaries. The increase in pH mainly results from tributary surface water and groundwater discharge, with a higher pH, mixing with the acid waters.

Generally, groundwater occurence and movement is controlled by the areas climate, geology, and topography. The groundwater systems in and around the lease area are local flow systems with recharge areas being topographically high and points of discharge being downslope.

Relative to deeper, regional ground water aquifers, local ground water aquifers have shorter flow paths, more rapid circulation of water and are more susceptible to fluctuations resulting from the recharge of precipitation. The groundwater discharge, in and around the lease area, is locally important for providing baseflows to the areas streams.

Both unconsolidated aquifers and fractured bedrock aquifers are potentially active in and around the lease area.

Recharge areas for the unconsolidated aquifers are areas that contain permeable surface materials (soils, talus, etc.) and are topographically high. The discharge areas are usually in and around stream channels and appear as springs, seeps or directly discharge into the stream from the alluvium.

According to United States Geological Survey personnel (oral communication with Ken Hon and Tom Brooks, January, 1983) both the quartz latite and tuffs found in the area are fractured and probably transmit water.

Any topographic high area where fractured bedrock outcrops or comes into contact with water laden regolith is a potential recharge area. As water flows downward, hydraulic pressures can move the water laterally or even upwardly to a point of discharge. It is possible that the acidic seeps, discussed in the water quality portion of this document, are part of this groundwater system.

The lease area is located within District 62 of Colorado Water Division 4. Presently most of surface and groundwater is appropriated by the State of Colorado. The annual discharge from Wade, Red Mountain, and Alpine Gulches is used to help satisfy water decrees downstream (i.e. the domestic water supply for the town of Lake City).

In the 1981 water year, District 62 had direct flow diversions amounting to approximately 2,773,109 acre-feet. Water use estimates are as follows: irrigation (4.6%); industrial and fish use diversions (95%); domestic (municipal and livestock) (0.17%); trans-mountain diversions (0.02%).

Winter Hazards

Due to the steep terrain and large winter snowpacks in and around the lease area, snow avalanches are a common occurrence. Generally, slopes greater than 45° produce loose snow avalanches which have less destructive force than slab avalanches which occur most frequently on slopes between 30° and 45°. Natural avalanche paths are usually located in steep gullies and on open slopes (30°-90°), where natural avalanche barriers usually consist of ridges, outcrops, and terraces. More site-specific avalanche hazard information is available at the BLM Montrose District - Uncompahgre Basin Resource Area Office (Perla, 1976).

E. Climate and Air Quality

Climate

The study area is located in a mountainous, continental climate regime characterized by dry air, sunny days, clear nights, high precipitation, moderate evaporation, and large diurnal temperature changes. The region's complex topography creates considerable variation in site-specific temperature, precipitation and surface winds, but without site-specific monitoring data, conditions at the tract site can only be surmised (Pedco Environment Inc., 1983). Extremely frigid conditions and blizzards can occur, but severe weather conditions such as tornadoes, floods and damaging hail are rare.

The extent to which vertical and horizontal mixing will take place is related to the atomospheric stability and mixing height. Unstable conditions can occur from strong surface heating, typical of summer afternoon's producing upslope winds. Neutral conditions reflect a breezy, well-mixed atmosphere. Stable conditions are enhanced by rapid radiative cooling and downslope drainage, producing the least amount of dispersion.

Inversions are formed under stable conditions, trapping pollutants within a certain layer of air. Moderate inversions are typical during the summer in the evening and dissipate at dawn. Winter inversions are stronger and last longer. Inversions are enhanced by weak pressure gradients, cold clear nights, snowcover and lower elevation.

The climatology of the PRLA tract site is unknown, and prolonged on-site monitoring is necessary to specify local conditions. The following description represents a "best guess" of climatic conditions at the site.

Temperatures vary mostly with elevation, and to a lesser extent, local microclimate. Generally, summer temperatures will probably range from lows of 23°F to highs of 59°F. Winter temperatures may range from -22°F to 14°F. Extreme temperatures may range from -49°F to 77°F and snowfall may occur from September to May.

Annual precipitation would be highly variable, ranging from 30 to 39 inches. Snowfall amounts could vary from 118 to 354 inches each year; with accumulation approaching 79 to 118 inches.

Although upper-level winds may predominate from the west and southwest, the diverse and rugged terrain of the study area would result in complex wind flows and surface winds. Synoptic (pressure gradient) winds would be forced around hills or channeled through valleys, but without strong gradient flows, diurnal upslope/downslope winds would predominate. Upslope winds usually occur on sunny mornings when the air at higher elevations heats rapidly and rises. Downslope winds occur when the air near the ground cools, becomes dense and sinks downward along drainages.

Air basins have been defined based on these drainage winds, indicating areas of similar atmospheric flow, topographic influence and general dispersion potential. Under stable conditions, pollutants tend to collect and concentrate in an air basin until regional synoptic winds disperse the air between basins. Generally, downslope winds around the PRLA tract would flow into the Colorado-Gunnison Air Basin.

Air Quality

The existing air quality (like climatology) at the site can only be surmised. For most pollutants, no monitoring data is available; the nearest particulate sampler is located nearly 40 km away in Telluride, Colorado in very different surroundings. However, the air quality of the study area is believed to be typical of undeveloped regions in the Western United States; ambient pollutant levels are usually near or below the measurable limits. Locations vulnerable to decreasing air quality from extensive resource development include the immediate operation areas (surface mines, milling operations, etc.), and local population centers with their induced impacts.

Although there is no gaseous pollutant monitoring in the study area, levels are estimated to be low and within standards. Preliminary estimates for pollutant concentration in rural Hinsdale County are presented in Table III-1.

Most of southwestern Colorado has been designated a PSD Class II, attainment area. Some towns have measured high TSP levels (exceeding the standards), but since the cause is primarily natural fugitive dust, these towns have been designated "unclassified" for TSP. The nearest PSD Class I areas are Mesa Verde National Park, and the La Garita and Weminuche Wilderness Areas. The former U.S. Forest Service Primitive Areas of Uncompahgre Mountain (now part of the Big Blue Wilderness) and Wilson Mountain (now partially included within Lizard Head Wilderness) are Colorado Category I areas. The BLM Powderhorn Primitive Area has been proposed for PSD Class I status, but is currently PSD Class II.

Table III- 1

Preliminary Estimated Pollutant Concentrations
in Rural Hinsdale County (micrograms per cubic meter)

Pollutant	Annual Mean a/	Quarterly Mean	2nd 24-hr Max	2nd 8-hr Max	2nd 3-hr Max	2nd 1-hr Max
Carbon Monoxide	-	-	-	2,300	-	2,300
Lead	-	0.5	-	-	-	-
Nitrogen Dioxide	3.8	-	-	-	-	-
Oxidants (Ozone)	-	-	-	-	-	118
Sulfur Dioxide	2.6	-	18	-	26	-
Total Suspended Particulates (TSP)	20	-	75	-	-	-

Source: B. Baird, 1983

a/ Nitrogen dioxide and sulfur dioxide values are arithmetic means. Total suspended particulates value is geometric mean.

F. Vegetation

The vegetation occurring within the lease application area and proposed stockpile area can be split into five major types 1) grassland meadow, 2) aspen woodland 3) aspen-spruce mixed woodland 4) spruce woodland and 5) rock-outcrop.

Grassland Meadows

This type occurs as small grassland parks surrounded by aspen or aspen-spruce woodland. It is capable of producing forage for both livestock and wildlife. The primary species occurring in this type are wild strawberry (Fragaria spp.), yarrow (Achillea lanulosa), lupine (Lupinus spp.), Thurber fescue (Festuca thurberi), mountain brome (Bromus marginatus) and june grass (Koeleria cristata).

Aspen Woodland

The aspen woodland type occurs primarily on south facing slopes within the lease area. Predominant species are quaking aspen (Populus tremuloides), Engelmann Spruce (Picea engelmanni), gooseberry (Ribes spp.), Colorado Columbine (Aquilegia caerula), mountain brome and Thurber Fescue. It is estimated this type produces 8,000 board ft. of aspen per acre.

Aspen-Spruce Woodland

This is the third largest type in the lease area. This type is dominated by a mixture of aspen and Engelmann spruce. Species include quaking aspen, Engelmann spruce, bluegrass (Poa spp.), heartleaf arnica (Arnica cordifolia), and lupine. Estimated timber production of this type is 6,000 board ft. of aspen and 3,000 board ft. of spruce per acre.

Spruce Woodland

This type is largely a mature spruce stand with little understory. It occurs primarily on the north and west slopes of the lease area. Species include Engelmann spruce, bluegrass, june grass and heartleaf arnica. This type produces approximately 11,000 bd. ft. of spruce per acre.

Rock-outcrop

Although the largest type within the lease area this type has only scattered vegetation occurring in rock crevasses and small isolated patches. Species are sky pilot (Polemonium viscosum), mountain sorrel (Oxyria digyna), and cushion phylon (Phlox)

There are no known threatened or endangered plant species within the lease or stockpile area. Table III-2 shows the acreages and present production of each of the vegetation types.

TABLE III-2

Vegetation Types and Acreages

Vegetation Type	Acres in Lease Area	Acres in Stock pile	Estimated Annual Production	Estimated Timber Production
Grassland Meadow	96	-	1,000 lbs/ acre	-
Aspen Woodland	182	58	-	8,000 bd ft/ac
Aspen-Spruce Woodland	381	111	-	9,000 bd ft/ac
Spruce Woodland	412	204	-	11,000 bd ft/ac
Rock-outcrop	596	14	-	-

Domestic Livestock Grazing: No livestock grazing presently occurs on either the proposed mining area or the proposed stockpile area due to lack of forage and steep topography.

G. Terrestrial Wildlife

Terrestrial wildlife habitats within the overall lease area are principally composed of associations of spruce-fir, mountain meadow and bare rock with lesser amounts of aspen, riparian and alpine transition. These vegetal associations provide potential habitat for an estimated 74 bird, 41 mammal species and up to 4 reptile and amphibian species. (Bissel 1978, Kingery and Graul 1978, and Hammerson 1982).

Typical representatives of bird species in the area include Mountain Bluebird, Common Flicker, American Robin, Violet-green Swallow, Hermit Thrush, Blue Grouse and Yellow-rumped Warbler. While chickaree, Nuttall's cottontail, snowshoe hare, pika, chipmunks, and golden-mantled ground squirrel are representative of mammals commonly found in the lease area.

Due to harsh winter conditions the herptile population is poorly represented. Of the 4 species possibly present the western terrestrial garter snake and tiger salamander are probably the most likely to be found.

According to the Colorado Division of Wildlife (DOW), big game use of the area is limited. DOW personnel estimate appoximately 10 deer and 15 elk use the mine area during the summer with approximately 170 deer and 260 elk present in the overall lease area. Additionally, they have noted that a few bighorns have occasionally wintered on the north side of Henson Creek near the mouth of Alpine Gulch.

At present, the only Federal or State listed threatened or endangered species known to potentially occur on the proposed lease are migrating Peregrine Falcons.

H. Aquatic Wildlife

The major streams associated with this proposal are Alpine Gulch and its tributaries, and Wade Gulch and Red Mountain Gulch.

Alpine Gulch is a tributary to Henson Creek and the Gunnison River drainage basin. Both Alpine Gulch and the East Fork of the Alpine Gulch were intensively inventoried during the 1982 field season to gather data concerning the aquatic and riparian habitat associated with these two drainages.

Alpine Gulch was inventoried from its confluence with Henson Creek to a point above the Middle Fork confluence, a total stream reach of 2.5 miles, the majority of which flows through lands administered by BLM. Fish species were observed but were not positively indentified by the inventory crew. However, according to Colorado Division of Wildlife stream inventories conducted in 1980, Alpine Gulch is an above-average fishery consisting of brown, brook, and rainbow trout. The stream has few beaver dams and shows little physical damage. What beaver dams exist add to the habitat quality and do not appear to cause any problems at this time. Aquatic macroinvertebrates were observed throughout the mainstem and were found to be numerous and diverse.

The diversity of these invertebrates appear to be lower downstream from the East Fork confluence than above it. The major riparian vegetation species in order of abundance along Alpine Gulch are willow, alder, pine, spruce, aspen, grasses and forbs. The width varies from an estimated 100 yards in bench areas above the lowest mile to approximately 30 feet where the stream meanders through a canyon in the lower mile. In general, the riparian habitat quality is good and the stream channel appears to be stable.

The East Fork of Alpine Gulch was inventoried for approximately 1.5 miles upstream from the confluence with Alpine Gulch. Water quality appears to be the major limiting factor affecting productivity in this stream. No fish were observed and aquatic invertebrates were scarce to absent up to the 1.2 mile mark. The physical habitat has the potential to support a variety of aquatic organisms but due to poor water quality, siltation and sedimentation, the productivity is noticeably limited.

The riparian habitat along the East Fork varies from 50 feet to 200 feet in places. Pine, spruce, and aspen comprise the overstory with alder and willow intermediate and common grasses and forbs as gound cover. The riparian habitat quality appears good except for dead spruce and pine located in a boggy area approximately 1.0 miles upstream.

Wade Gulch is a small tributary to the Lake Fork of the Gunnison River. No fish were observed in this stream but aquatic invertebrates were found to be numerous and diverse. The gradient fluctuates from moderate to steep and the stream has good to excellent riparian habitat.

Red Mountain Gulch is a small intermittent tributary to the Lake Fork Gunnison River. At the present time it has little value as a fishery but provides habitat for other aquatic and semi-aquatic organisms.

I. Recreation

The Red Mountain area (Elevation 12,826 ft.) with its alpine tundra, numerous canyons, steep drainages, and high ridges provides an excellent opportunity for a variety of recreation activities. These activities include the viewing of scenery, hiking, backpacking, horseback riding, camping, picniking, hunting, fishing, mountain climbing, and photography.

There are two primitive roads in the area; Wade Gulch and Red Mountain Gulch. Also included in the area is Alpine Gulch Trail; this trail permits foot and horse use only. No accurate use data is available and there are no trail or traffic counters in the area at this time.

There are several organized groups as well as private individuals and parties that use the area during the summer season for day hiking, backpacking and mountain climbing. Colorado Outward Bound School is one of these organized groups and they have projected a yearly use figure of 1,250 Recreation Visitor Days (RVDs). They have used the area, along with adjacent lands on a continuous basis since 1970. Because of the good road access to trailheads and its proximity to the vacation destination community of Lake City, the Red Cloud area receives a heavy amount of day-use from visitors during the summer months.

There are two developed motorized vehicle campgrounds and one developed recreation area near the periphery of the Red Mountain area. These developed sites are Mill Creek Campground (BLM), Williams Creek Campground (FS), and Lake San Cristobal (Hinsdale County, Colorado). In 1982, Mill Creek Campground received an average of 56 visitors per day for a 120 day season of use. Williams Creek Campground received 91.6 recreation visitors per day for a 120 day season of use. Lake San Cristobal received 40 recreation visitors per day for a 120 day season of use.

Vehicular travel and viewing of scenery are the recreational activities receiving the greatest amount of use around the periphery of the Red Mountain Area. The recreation use along the "Loop Road" (Hinsdale County Road Numbers 1 & 2, and BLM Transportation Plan Road Number 3300 and 3306) is estimated at 125 private vehicles and 654 commercial vehicles per day for a 120 day season. Private vehicles average 4.2 people per vehicle (personal communication, Hinsdale County Sheriff 1980). This use would total 63,000 RVDs per season. Commercial vehicles average 8.9 people per vehicle (commercial vehicle use data from town and rental businesses in Ouray, Silverton, and Lake City). This use would total 698,472 RVDs per season; thus total private and commercial use totals 761,472 RVDs per season. Scenic vehicular recreation use is the most intensive recreation activity occurring in the area and one that has the greatest demand on transportation systems.

J. Cultural Resources

There have been no formal inventories for cultural values in the areas of potential impact. However, historic resources are known to exist in the area, which are related to the late 19th and early 20th century mineral exploitation of the Lake City area. Some of these sites may be of local or regional historic significance. No prehistoric sites are known in the vicinity of the project.

High altitude prehistoric sites are known in the San Juan mts. but they are very rare. The rariety of this type of site makes them significant since so little is known about aboriginal adaptation to high mountain environments. Two Class I (overview) documents have been prepared for the Gunnison Resource Area. One discusses the history of the area (Frontier In Transition by Paul O'Rourke BLM Cultural Resource Series No. 10, 1980) and the other discusses the known archeology of the area and defines the potential for data gathering and research (The Archeology of the Uncompahgre and Gunnison Resource Areas by Alan D. Reed and Douglas D. Scott - BLM Cultural Resource Series No. 13, 1982). Both documents acknowledge the potential for resources in the area of the alunite deposits and lease area.

K. Visual/Noise

1. Visual Resources

The visual resources of the area are described in URA documents as having some of the most outstanding scenic quality (Class A) and highest sensitivity in the Gunnison Resource Area. This is mainly due to the great diversity and variety in natural landscape features comprising the scenery along highway #149 and the loop road, and the great numbers of recreation visitors who come to enjoy it.

Because of its scenic beauty and the natural processes which created it, the Red Mountain area has been considered for various types of designations such as primitive and ACEC. However, none of these designations have been approved. The area is presently under BLM MFP Visual Class II guidance, which is aimed at maintaining low visual contrast levels in new modifications. The extreme ruggedness and visual variety of the area, together with a limited number of viewer positions for most people contribute to a high ability of the landscape to naturally conceal visual modifications from the nearby roaded recreation settings. Views of Red Mountain from Colo. #149 are limited, and the only view possible from the loop road is at the mouth of Red Mountain Gulch. The mountain is visible beyond the foreground foothills from Lake City. Views become more exposed to the highway as it climbs out of the Lake Fork toward Slumgullion Pass. Red Mountain is highly exposed to viewing from surrounding peaks and other elevated viewer positions up to 10 miles away in all directions. Many of these positions are from primitive or wilderness settings.

2. Noise

The area is characterized by relatively quiet natural sounds interrupted occasionally by man caused noise. The proposed mine site, stockpile and service areas are dominated by wind caused noise vibrations on the rugged terrain surface and vegetation. Along the transportation routes, the ambient noise is compounded by the sound of rushing streams. The stretches along Henson Creek, the Lake Fork and Lake City also include noise from motor traffic on the gravelled loop road and the paved highway, Colo. #149. The composition in Lake City includes incidental noise from commercial and business activity, with some small scale manufacturing related emissions. Overall, the seasonal pattern shows a peak noise level in the summer, related to the high level of activity along travel routes and in town. The daily emissions peak during mid morning and late afternoon, with definite quiet periods at night.

The measures used to assess the levels are the 24 hour equivalent sound level (Leq(24)) and the weighted day/night average sound level (Ldn). The Leq(24) is used by EPA to relate cumulative noise exposure of individuals regardless of location or circumstances, to the potential for hearing loss. The Ldn is used to determine potential activity interference and annoyance problems in areas where a quiet environment is necessary, such as residential areas, campsites and other areas where human beings may be exposed over one or more days.

The population affected by noise in this area includes permanent residents, seasonal residents and recreational visitors, as well as various forms of wildlife. The most sensitive receivers are primitive recreation visitors to the Red Mountain area and the nearby peaks, many of whom use the Alpine Gulch trail for access.

L. Socio-Economic

Hinsdale County is highly dependent on tourism for its socio-economic well being. Its population expands from approximately 400 during winter and spring months to 4600 during peak summer and autumn months. As a consequence of its almost singular dependency on tourist dollars, Hinsdale County suffers from a relatively low level of per capita income.

Population

Census figures show that Hinsdale County had a resident population of 408 in 1980 1/. This figure is estimated to have decreased to 389 in 1982 2/. 21 percent of the 1982 population (80 persons) were school age 2/.

A complete picture of Hinsdale County population requires inclusion of summer residential and tourist population figures. Table III-3 shows 1982 monthly population estimates of Hinsdale County broken down by perminent residents, summer residents and tourists. These figures yield an annual population mean of 2532 3/. (Footnotes at end of Chapter).

Table III-3
Estimated Monthly Population 1982

Months	Dec. - April	May	June - Sept.	Oct.	Nov.
Permanent Residents 2/	390	390	390	390	390
Summer Residents 3/	-	420	840	510	840
Tourists 3/	-	2020	3370	1690	3370
Total	390	2830	4600	2590	4600

Employment

In 1982, 157 persons are estimated to have been employed in Hinsdale County. Federal and state government followed by construction were the major employment sectors. Table III-4 presents 1982 estimated employment by industry 2/.

Table III-4
1982 Employment by Industry 2/

Industry	Persons Employed
Agricultural Properties	13
Agricultural Labor	3
Mining	0
Construction	14
Manufacturing	1
Transportation, Communication, Utilities	1
Trade (Wholesale and Retail)	12
Finance, Insurance, Real Estate	7
Services	10
Government	40
Other	51
Total	157

Per Capita Income

Per capita income is relatively low among permanent residents of Hinsdale County as compared with the Colorado average. In 1980 the county had a per capita income of $8,018 as compared to the Colorado figure of $13,430 (figures in 1982 dollars) 4/. 1982 estimates show per capita income having dropped to $7,796 2/.

Infrastructure

Hinsdale County has a number of infrastructual deficiencies. These deficiencies are probably the long term result of a relatively small number of tax payers providing facilities for a large number of tourists.

Infrastructural facilities that are currently at or streached beyond capacity are: water system, sewage system, fire protection, medical facilities, police protection, school system and dump site 5/.

M. Wilderness Resource

The Redcloud Peak WSA contains 38,400 acres of which approximately 280 acres are private mineral patents within the boundaries of the WSA. Approximately 1,320 acres of state-owned minerals with the surface administered by BLM are also within the boundaries.

M. The area includes the majority of the Lake Fork Mountains, an extremely rugged and colorful chain of volcanic mountains within the Lake City Caldera. It is characterized by numerous 13,000 foot mountain peaks and ridges. Redcloud Peak, 14,034 feet, and Sunshine Peak, 14,001 feet, are dissected by glaciated valleys radiating towards either Henson Creek on the north or the Lake Fork of the Gunnison River on the south and east. The upper valleys have steep, sparsely vegetated, talus covered side slopes 800-1,200 feet high.

The central core of this WSA is alpine tundra. The peripheries and large portions in the eastern half of the WSA are heavily forested in spruce and aspen. It contains rock glaciers and numerous cascades and waterfalls. Cooper Lake is the only major lake within the WSA. Mineral prospects and old cabin remnants are all substantially unnoticeable and may be of historical value.

Some imprints associated with mining and access are found within the WSA. Old vehicle ways are found in Cooper Creek, Alpine Gulch and Williams Creek. The Alpine Gulch way has not been maintained for over twenty years. Spruce trees and aspen, as high as ten feet, now grow in the center of the path. In several locations, the route is washed out. The Williams Creek track has been water-barred and some downed aspens block passage. The route up Cooper Creek is a two-wheeled track. All of the ways were found to be substantially unnoticeable within the context of the wilderness.

The overall influence of human imprints on the naturalness of the area as perceived by the average visitor is negligible. The Redcloud Peak WSA contains outstanding opportunities for solitude. The area is extremely rugged; high mountain peaks and cascading streams provide numerous opportunities for experiences of solitude. The mountainous terrain, with its expanses of alpine tundra and open scenic vistas, projects feelings of vastness. The lower elevations and canyons in the eastern portion of the area contain densely forested lands which create a feeling of seclusion and intimacy.

The WSA, due to its relatively large size, diversity, and ruggedness of terrain, offers outstanding opportunities for primitive and unconfined recreation. The numerous peaks, including Redcloud Peak and Sunshine Peak, provide excellent hiking and climbing opportunities. The glacial valleys, waterfalls, and tarns facilitate recreational activities such as backpacking, camping, fishing, and photography. Wildlife viewing and hunting are also activities which occur in this WSA.

The scenic quality of the area is outstanding due to the combination of mountainous landforms, multi-colored rock outcrops, diverse vegetation and vast, open vistas.

There are scientific and educational as well as geologic and ecologic values as this area is an extinct volcanic caldera with abundant wildlife--deer, elk, bighorn sheep, and golden eagles.

Footnotes

1/ 1980 Census

2/ Planning and Assessment Model

3/ Data Collected by Hinsdale County Water and Sanatation District

4/ Bureau of Economic Analysis Personal Income by Major Sources 1982

5/ Telephone Interviews and Letters from Hinsdale County Officials

6/ Colorado Travel and Tourism Statistics 1980, Business Research Division, Graduate School of Business Administration, University of Colorado

1V. Environmental Consequences

Assumptions

In analyzing the Company's proposal and the various alternatives, several assumptions had to be made. Some of these are general in nature and apply to all alternatives. Others are specific to the particular alternative and therefore will be listed with the discussion of that alternative, later in this section. Those that apply to essentially all the alternatives are that:

1. 75% of the production increase, resulting from this project, will reside in the Lake City area.

2. Sometime during the life of the project a temporary closure or "bust" would occur and unemployment would result during the duration.

3. Needed power and telephone lines would be above ground and that the powerline would be a three phase, 14 kv line with 35-40 foot poles and cross arm.

4. The needed access road would have a 24 foot running surface.

5. Some drilling and blasting will be required in any of the mining methods analyzed.

A. Lands and Access

1. Company's Mining Proposal Alternative

As proposed the project will require a number of different land use authorizations. Following is a listing of consequent lands actions listed in categories.

Category 1 - Rights-of-way for Access, Transportation and Utilities
A) Access R/W 7 miles x 24 ft. wide.
B) R/W's for electric power & phone lines, overhead lines 5 to 7 miles.
C) Water impoundment, transportation and storage facilities i.e. settlement ponds, pumpsites, pipelines and head tank sites.
D) R/W for tube express for transportation of ore.

Category 2 - Land Use Authorizations on lands off the lease tract for purposes other than those in Category 1.
A) Lease of 387 acres for stockpile of lowgrade ore.
B) Permits for water and air quality monitoring stations.
C) Appurtenant temporary land use authorization.

Category 3 - Land use authorizations on the lease hold.
A) Mine service site 10 ac.
B) Hazardous substance storage and containment facilities.
C) Mining operations solid waste disposal sites.
D) Drainage diversion structures for protection of mining facilities.
E) Other minor ancillary R/W land use authorizations in connection with the mining operations.

Category 4 - R/W and Land Use Authorizations as a result of increased population.

A) Access and utility R/W's to new house sites and/or new subdivisions.
B) Expansion of county sanitary landfill capabilities.

2. Strip Mine Alternative

This alternative, for all practical purposes would require the same land use authorizations as the company's mining proposal with one exception, that is the stock pile area would not be needed.

3. Accelerated Production Alternative

This alternative would require the same actions as the company's mining proposal except no right-of-way would be necessary for the stockpile area.

4. Transportation Alternatives

Transportation of ore by truck via Alpine Gulch would require a much wider right of way (R/W) at a grade less than 10%. This would require a road of 5 miles or more from the mine service area to Henson Creek. In addition a road R/W around the west side of Lake City approximately 2 miles would be needed. Transportation of ore by tram or conveyor would require approximately 5 miles of R/W to the railhead.

B. Geology and Mineral Resources

If a lease is issued and development of the alunite is allowed, there will be a domestic source for two commodities for which the United States is now dependent upon foreign sources. Over 90 percent of the raw material from which aluminum metal is made, and 65 percent of the potash fertilizer used in the United States is imported. Aluminum is one of the materials listed by the Federal Emergency Management Agency as a strategic and critical mineral.

An additional benefit of mine development in this area is that improved access into this otherwise remote area could permit discovery of other mineral deposits which have been shown to have potential in the area.

1. Company's Proposal Alternative

Under this alternative, ore production would be about 4 million tons annually. Assuming an average grade of 40% alunite and recovery of 90% of the contained aluminum, as indicated by the amenabilty test results, this production rate would yield about 250,000 tons of aluminum metal annually, or about 5% of domestic consumption. Similarly, about 7.5% of the demand for potash fertilizer could be met. Under this alternative the life of the mine could be 100 to 400 years at the specified production rate, and would depend on what additional reserves are identified as development and production ensue. Another factor which could affect end-product output is technological advances which can only be achieved after full production is realized and is only speculative at this point.

2. Strip Mine Alternative

Under this alternative, daily and annual production rates are assumed to be the same as in the Company's Proposal. Most other items discussed under that alternative are also applicable here. The major difference is that some of the ore containing 40% alunite or greater would be unrecoverable by this method. The applicant estimates only 50% of the high grade ore would be recovered. This is not good mining practice and represents inefficient use of natural resources.

3. Increased Production Alternative

Under this alternative, reserves would be depleted twice as fast as in the Company's Proposal alternative and end product percentages of consumption would be doubled. Mine life would be shorter by about 50%. All ore of economic grade would be recovered. Transporting low-grade material off-site would increase transportation costs.

4. Transportation and Access Alternatives

None of these alternatives would effect the mineral resources.

5. No Action Alternative

Under this alternative, no lease would be issued and there would be no production of alunite ore. If it is determined that the lease would not b in the public interest, the lease exchange provision of 43 CFR 3526 may be invoked. Determination can be made only after the applicant has submitted the final showing pursuant to 43 CFR 3521.1-1(c) through (e).

C. Soils

Company's Mining Proposal

Mining operations would cumulatively disturb approximately 812 acres at the end of mine life. Approximately 450 acres of this disturbance would occur on soil while 362 acres disturbance would occur on rock outcrop or rubble land.

Urban area expansion associated with this mining operation would disturb approximately 10 acres by the year 2003.

No reclamation would be attempted on the ore body site, since it is presently over 90% rock outcrop. The loss of soil productivity, indefinitely, on 387 acres resulting from the low grade ore stockpile would be an unmitigated loss. Over 80% of this area is deep, productive soil supporting a mature stand of 4 to 5 million board feet of commercial timber.

Strip Mine Alternative

Mining operations would cumulatively disturb approximately 615 acres at the end of mine life. Only 75 acres of this disturbance would occur on soil while 540 acres would be on rock outcrop and rubble land.

Urban area expansion would disturb 10 acres by the year 2003.

Accelerated Production Alternative

Mining operations would disturb the same acreage as in the Strip Mine Alternative.

Urban area expansion associated with this mining operation would disturb approximately 16 acres by the year 2003.

Company's Transportation/Access Proposal

Approximately 34 acres surface disturbance to soil would occur by the year 2003 due to the construction of the access road and a portion of the tube express.

Alpine Gulch Haul Alternative

Approximately 59 acres surface disturbance to soil would occur by the year 2003 due to the construction of the haul road. The location of the disturbance would be the same as in the Company's Transportation/Access Proposal.

Wade Gulch Access Alternative

Approximately 34 acres surface disturbance to soil would occur by the year 2003 due to the construction of the access road and tram or conveyor. Less problem with low load-bearing strength of wet soil and less drainage problems would be encountered using this route.

Red Mountain Gulch Access Alternative

Approximately 40 acres surface disturbance to soil would occur by the year 2003 due to the construction of the access road and ore transportation system.

No Action Alternative

Baseline urban area expansion would disturb aproximately 35 acres by the year 2003.

Mitigation

1) Surface disturbance must be minimized to that necessary for construction and operations.

2) Revegetation of road, transportation system, and utility rights-of-way must be accomplished in the first favorable season following construction.

3) If a low grade ore stockpile is created and subsequently removed at a future date, all exposed soil should be revegetated and the site restored to its premining land use.

D. Water Resources

1. Company's Mining Proposal

a. Stockpile

The placing of the low-grade ore stockpile in the East Fork of Alpine Gulch would create adverse impacts to the hydrologic system in the study area. The stockpile would disrupt the natural drainage basin morphology which has an important and complex relationship to the local surface and ground water systems.

The stockpile would cover several acres of spruce-fir forest which presently evapotranspire approximately 15 inches of water per year. The elevated bare surface of the stockpile would be subjected to higher velocity winds which would result in a re-distribution of some portion of the snowpack. The snow could be blown to other parts of East Alpine Gulch, to other watersheds, or sublimed and lost to the local area.

Due to snow losses and the high infiltration rate of the stockpile, reductions in peak flows and the total annual water yield could be expected. Essentially all precipitation would infiltrate the stockpile taking it longer to reach stream channels. The infiltrated water would have a longer contact time with the underlying materials, some of which could be recharge areas for the local groundwater and interflow systems.

The withdrawal of 32 acre-feet per year from East Alpine Gulch, for use at the mine site, would result in further reductions in the flow of this stream. A reduction in the total flow volume and peak discharge rates of East Alpine Gulch would result in changes to the physical and biological components of the stream channel for an unquantifiable distance downstream from the stockpile.

The stockpile would be comprised of rock with freshly exposed mineral surfaces, some of which could be pyrite. Pyrite exposed to the elements would oxidize (resulting in acid formation) and add to the already existing problem in East Alpine Gulch. Additional acid discharge would result in impacts further downstream (due to the lack of neutralizing minerals found in the local geology) and possibly contaminate the local groundwater and interflow systems.

If large amounts of highly acidic water are discharged, it is possible that the alluvial groundwater and surface water used for Lake City's domestic water supply could be degraded (Lake City's water supply comes from two wells and an infiltration gallery approximately 5 miles downstream from the proposed stockpile). Shut down of the Lake City water system as a result of this degradation is the worst possible result of the process and poses a potentially devestating effect upon the Lake City population.

b. Mine

The mining of Red Mountain would result in adverse hydrologic impacts in the study area. The major impacts would be similar to those resulting from the placement of the lowgrade ore stockpile in East Alpine Gulch.

The topography of Red Mountain would be altered resulting in changes to the natural drainage basin morphology. Consequently changes in snowpack distribution, rainfall/runoff relationships, the annual water yield, and water quality would occur.

The drainages that would experience some degree of impact would be limited to Alpine Gulch, E. Alpine Gulch, and Red Mountain Gulch since the portion of Red Mountain contributing flow to Wade Gulch would not be mined under this alternative. Without more detailed data and field analysis, it is impossible to quantify these impacts.

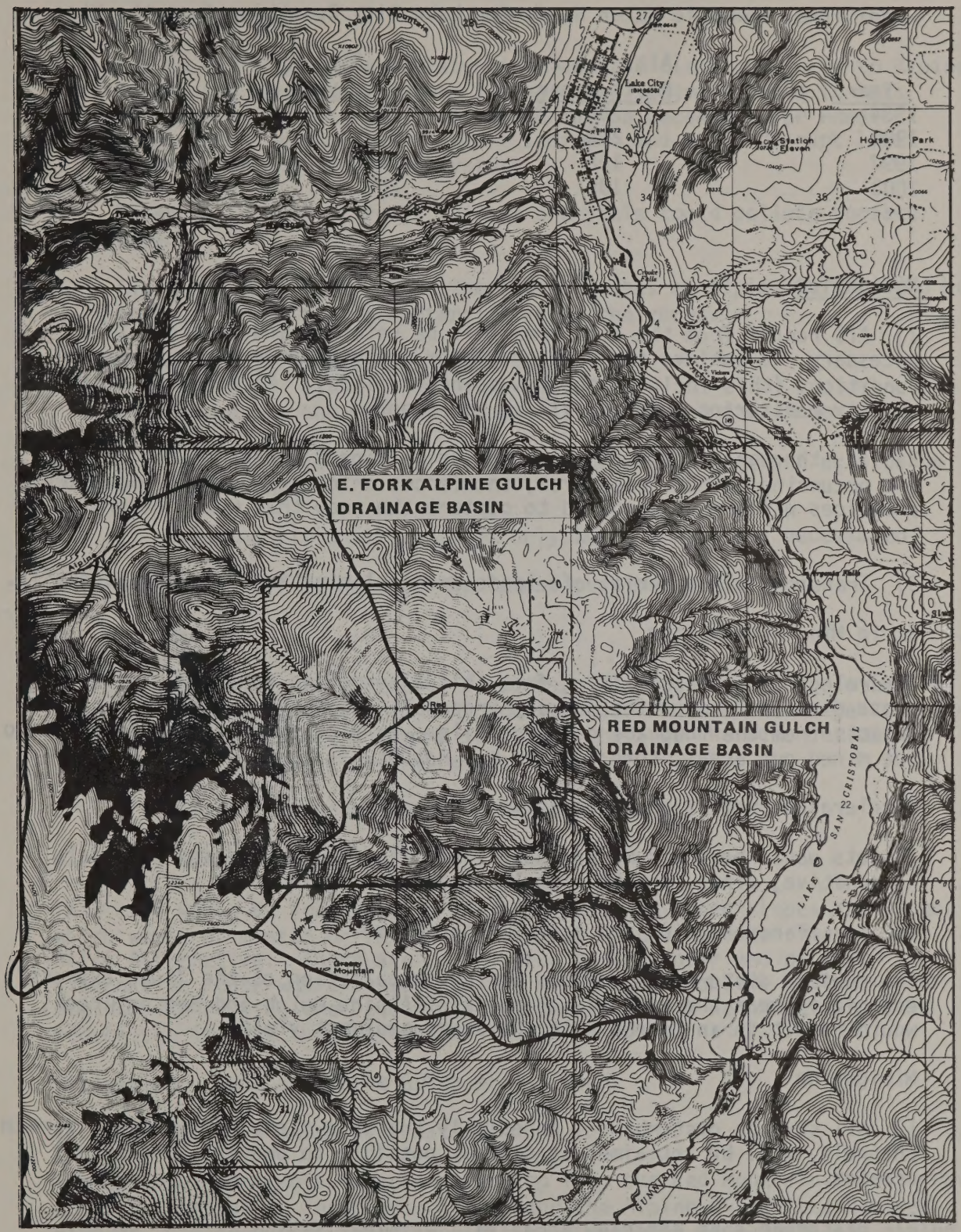
Water Quality would be degraded if the freshly exposed mineral surfaces contain pyrite. The surface water, groundwater, and interflow systems in Alpine Gulch and E. Alpine Gulch and Red Mountain Gulch could be affected leading to potential shut down of the Lake City water system (see map 6).

The sediment yield in the above mentioned drainages would also increase to some unquantifiable degree, from the blasting and crushing of the ore.

The 32 ac.ft/year of water that would be withdrawn from East Alpine Gulch for mine use should not seriously injure any present or future water decree holders in the study area. To date, there have been no calls (water shortages) on either the Lake Fork of the Gunnison River or Henson Creek (oral communication February, 1983 with Ed Hoffman, Water Commissioner for Colorado State Water Division 4, District 62).

The influx of people to the Lake City area, from the mine, would result in impacts to the towns water and sewer systems. Not only would the town have to expand their present water and sewer systems but additional water rights may also be needed. Damage to these old, shallow-buried systems could result from heavy equipment traveling through town during the mine construction phase.

The amount of water necessary to satisfy the increase in Lake City's population would vary both annually and during the entire life of the mine. Due to complications (leaks, freezing problems, etc.) with Lake City's present domestic water system the per capita daily use varies from 2850 gpd (gallons per day) in the winter months to 260 gpd in the summer months. For the purpose of analysis, a weighted average of 1350 gpd per person will be assumed. In addition, an assumed 75 percent of the expected population increase would be using Lake City's domestic water supply (for total additional water needs in the years 1984, 1990, 1997, and 2003 see table IV-1).



MAP . AREA OF POTENTIAL ADVERSE IMPACTS TO WATER

TABLE IV-1

Additional Domestic Water Needs for Lake City Resulting from the Mine

Year	Alt. 1 & 2 Ac-ft./year	Alt. 3 Ac-ft./year
1984	60	60
1990	213	310
1997	196	295
2003	185	281

Mitigation:

1) All runoff from the mine area will be retained and treated, if necessary, to achieve the same or higher quality water than pre-mining conditions (this includes total suspended solids). An adequate water quality monitoring program will be implemented.

2) If, through a monitoring program, significant losses of the snowpack are occurring on the lease area, snowfences or other snowpack management practices will be constructed to capture the snow that would otherwise be lost.

3) Transport all material off lease area, eliminating need for stockpile.

2. Strip Mine Alternative

Hydrologic impacts resulting from this alternative would be similar to those discussed under the Company Proposal Alternative, omitting the impacts from the lowgrade ore stockpile. By placing the lowgrade ore into the mined out areas, some impacts may result.

3. Accelerated Production Alternative

Impacts would be the same as those identified in the Company Proposal Alternative, minus impacts from low-grade stockpile.

4. Company Transportation and Access Alternative

The surface disturbance created by the installation of the "tube express", especially near the drainage channels of Alpine Gulch and Henson Creek, would result in an increase in the areas sediment yield.

Mitigation

1) All surface disturbance, especially areas in close proximity to stream channels, will be reclaimed as soon as possible to prevent unnecessary erosion.

2) Disturbance to riparian areas will be minimized.

5. Alpine Gulch Haul Road Alternative

a. Access Road

Due to the land surface disturbance and the close proximity to Alpine Gulch, the access road would increase the sediment yield in this drainage. The cuts and fills which may be necessary for road construction would also increase sediment and could disrupt local groundwater and interflow systems.

Potential spills of fuels, oil or chemicals could pollute surface water.

The road, especially along the lower reaches of Alpine Gulch would be passing across several potential avalanche zones.

Mitigation (Alpine Gulch Access Road)

1) Damages to the riparian zone will be held to a minimum

2) Road drainage systems will be constructed to prevent erosion on the road surface

3) Cuts and fills will be used only where absolutely necessary

4) Roads will be held to the lowest possible grade

b. Haul Road

This proposal would result in adverse hydrologic impacts similar to those discussed above for the access road. Due to the larger surface area of this road, and more vehicular traffic, the adverse impacts would be unquantifiably more significant.

Mitigation: Same as Alpine Gulch Access Road.

6. Wade Gulch Alternative

This road would be located, for the most part, on upper slopes and ridges which would eliminate or lessen the impacts discussed under The Alpine Gulch Alternative. There are a few areas on the upper end of this alternative route where avalanches may cause some problems in the winter months. Re-routing the road to the southeast around Red Mountain would reduce the impacts that may result from avalanches.

Mitigation: Same as Alpine Gulch Access Road.

7. Red Mountain Gulch Alternative

The adverse hydrologic impacts resulting from the Red Mountain access road would be similar to those described under the Alpine Gulch Alternative. However, the degree of impact would lie between the Wade Gulch and Alpine Gulch access route alternatives.

Mitigation: Same as Alpine Gulch Access Road.

E. Climate/Air Quality

Climate

In the area immediately surrounding a mining development, local wind patterns may be affected by alteration of the topography or building construction. Land clearing could alter the reflection and evapotranspiration of the ground resulting in temperature and humidity changes. All of these potential impacts would be very localized. No significant impacts to regional climate are anticipated under any proposed development alternatives.

Air Quality

As outlined previously, atmospheric pollutant concentrations in the study area are believed to be within State and Federal air quality standards, but any new emissions source in the region would increase pollutant concentrations. In order to determine the potential pollutant contribution of Earth Sciences' proposed alunite mining activities, pollutant concentrations were estimated using EPA's COMPLEX I atmospheric dispersion model.

Three potential development alternatives were analyzed. The low alternative reflects the company's proposal; bench mining the southwest portion of the alunite deposit, stockpiling the low grade material, and transporting 12,500 tons per day of the high grade ore via "Tube Express". The moderate alternative level assumed the entire alunite deposit would be bench mined, low grade material would be backfilled into the mined out area, and 12,500 tons per day of high grade ore would be trucked to the Lake City railhead daily. The high alternative also assumed the entire alunite deposit would be bench mined, at double the company's proposed production rate, without stockpiling, requiring truck transportation of 37,500 tons per day of mixed ore to the Lake City railhead.

Pollutant emission totals for these three alternatives are presented in Table IV-2

Table IV-2
Total Emissions (grams per second)

Production Level	Emissions				
	TSP	NO_x	CO	SO_2	HC
High	49.8	42.1	14.5	2.5	3.5
Moderate	17.4	18.1	9.4	1.1	2.0
Low	18.2	13.1	8.5	0.8	1.7

Gaseous pollutant concentration levels (due to diesel-powered mining equipment, light duty trucks, home heating, etc.) were not modeled due to the relatively small amount of emissions when compared to air quality standards and background concentration levels. Gaseous pollutant standards are not expected to be exceeded.

Table IV-3

Predicted Total Suspended Partical (SP) Concentrations (micrograms per cubic meter)

	24-Hour				Annual		
Production Level	Back-Ground	Modeled Highest	Modeled Second Highest	Standard	Back-Ground	Modeled Average	Standard
High	75	260	159	150	20	65	60
Moderate	75	116	37	150	20	29	60
Low	75	74	64	150	20	18	60

NOTE: Underlined values indicate potential for exceeding standards.

As indicated by the underlined values, there is a potential for exceedance of ambient air quality standards under the moderate and high development scenarios (background plus modeled concentrations). Under the low alternative, the Colorado and Federal 24-hour secondary TSP standards are predicted to be reached but not exceeded. These results must be evaluated with an understanding of the general limitations of air quality modeling in complex terrain, especially without knowing site-specific meteorologic conditions and having monitored pollutant concentrations. Actual industrial development will require detailed monitoring and modeling to obtain necessary air quality permits (i.e., detailed development NEPA analysis, PSD permit review, Colorado Air Contaminant Emissions Notice and Permit, and others).

In summary, based on limited information, development of an alunite mine near Lake City, Colorado, will have an "unavoidable, adverse impact" on air quality, and under the medium and high development alternatives, these impacts are predicted to be significant. The specific level of significance will depend on the actual on-site meteorology and EPA's potential implementation of a fine particulate standard. Since BLM lessees cannot conduct their activities in violation of any applicable air quality standard or related plan of implementation, impacts from actual development cannot exceed the standards.

F. Vegetation

The following table illustrates the acres of anticipated impacts of each of the alternatives. It is assumed that the vegetation within each alternative will be removed and that reclamation of these sites is not feasible.

Table IV-4
Impacts on Vegetation (acres)

Vegetation Type	Company Mining Proposal	Stripmine	Accelerated Production	Company's Transportation	Alpine Gulch Haul Rd.	Wade Gulch Access	Red Mtn. Access
Grassland Meadow	-	-	-	-	-	-	-
Aspen Woodland	58	9	9	-	-	-	-
Aspen-Spruce Woodland	111	56	56	9	24	9	9
Spruce Woodland	236	42	42	-	-	-	-
Rock-outcrop	373	549	549	-	-	-	-
TOTAL	778	656	656	9	24	9	9

The Company Mining Proposal would necessitate the removal of 4 million bd. ft. of timber primarily spruce. This timber would need to be removed prior to construction and could be hauled down the same access roads developed for the mining operation.

The Strip Mine and Accelerated Production Alternatives would involve the removal of approximately 1 million bd. ft. of timber. This would be both aspen and spruce and again could be removed using the access and haul roads developed for the mining operation.

The Company's Transportation, Wade Gulch and Red Mtn. Access Alternatives would involve the removal of approximately 81,000 bd. ft. of aspen and spruce due to widening and rerouting of existing access roads.

The Alpine Gulch Haul Road Alternatives would result in the removal of approximately 216,000 bd. ft. of mixed aspen and spruce due to the construction of the haul road up Alpine Gulch.

G. Terrestrial Wildlife

1. Company's Mining Proposal

The mining and stockpiling of alunite will directly impact those animals inhabiting the mine and stockpile areas. This impact will be greatest for those species with low mobility and small home range or whose adjacent habitat is already saturated and will not absorb additional individuals, as in the case of most bird species. The removal of these habitats, then, will result in the eventual loss of all animals inhabiting these sites with the exception of a few individuals of species which occupy underutilized habitats and have high mobility; such as deer, elk and mountain lions.

From a regional and even from a more local perspective the loss of these individuals from the species population will be insignificant since all the impacted habitats are relatively widespread and well represented.

Suitable wintering areas seem to be one of the major factors controlling big game populations in this area. Since neither the mine nor stockpile area will directly remove winter range the probable impact will be the displacement of approximately 50 deer and 100 elk from underutilized summer range.

2. Strip Mine Alternative

Impacts to terrestrial wildlife would be the same as in the Company's Proposal except without the stockpile, only 20 deer and 30 elk would be displaced.

3. Accelerated Production Alternative

Impacts same as in the Strip Mine Alternative.

4. Company's Transportation/Access Proposal

The access road and tube express will eliminate 36 acres of non-game habitat in Alpine Gulch and an estimated 500 acres will be degraded as a result of dust and noise during and potentially after the construction phase. Removal of riparian habitat along Alpine Gulch would eliminate most animals of low mobility and small home range. This would be especially debilitating to species such as screech owls, Lewis' woodpecker, willow flycatcher, and Swainson's thrush, which seem to use riparian communities exclusively during at least one part of their life cycle. The routing of this system through Alpine Gulch would also cause the displacement of an estimated 30 deer and 45 elk.

If the Tube Express takes the Capitol City route, the possible displacement of 70 deer and 100 elk would result, if allowances are not made for big game passage.

If the Tube Express takes the Lake City route, possibly 20 deer and 20 elk would be displaced if the tubes are not modified to allow big game passage.

5. Alpine Gulch Haul Road Alternative

Impacts in the Alpine Gulch area are similar to the Company Proposal except that 61 acres of habitat, instead of 36, will be lost and 600 acres will be degraded instead of 500.

6. Wade Gulch Access Alternative

Very few, if any, significant impacts are anticipated as a result of vehicluar access to the mine area. This route could cause the displacement of up to 15 deer and 15 elk during the summer from meadows to the NE of the proposed mine locations.

7. Red Mountain Gulch Access Alternative

The principle impact to terrestrial wildlife from this access route would be the disruption and possible displacement of approximately 20 deer and 30 elk.

H. Aquatic Wildlife

1. Company's Mining Proposal

The major impacts resulting from this proposal are associated with the degradation of water quality and the loss of aquatic/riparian habitat. The mining operation and stockpiling of materials in the upper part of the East Fork of Alpine Gulch will cause greater surface area to be exposed to precipitation, resulting in greater concentrations of sediment and dissolved solids. The loss of riparian vegetation associated with the upper part of the channel will also reduce the "filtering" effect that riparian vegetation provides the stream system. This will further increase the sediment from within the system. Since water quality currently appears to be the major factor limiting productivity in the East Fork, further deterioration of water quality and loss of aquatic/riparian habitat is expected to cause adverse impacts downstream. These increases could cause irreversible adverse impacts on the aquatic and semi-aquatic species within the mainstem of Alpine Gulch and, depending on the magnitude of these increases, could impact the fish and aquatic invertebrates in Henson Creek. Depending on minimum flows required to sustain aquatic life in East Alpine Gulch, the withdrawal of 32 acre feet per year may impact aquatic species as well as increase the concentration of dissolved solids, thus having a greater potential impact on water quality downstream.

Strip Mine Alternative

The impacts of the mining operation under this alternative will be similar to those mentioned under the Company Mining Proposal. The impacts resulting from the loss of riparian vegetation and aquatic habitat will be reduced, however, since there would be no stockpile area. Water quality would not be expected to improve under this alternative and the impacts on water quality would be the same as those mentioned under the Company's Mining Proposal. Although these impacts are unquantifiable at this time, it is anticipated that water quality in the East Fork will continue to deteriorate and the mainstem may ultimately be affected by increased sediment transport and dissolved solids.

3. Accelerated Production Alternative

The impacts under this alternative would be similar to those mentioned under the Strip Mine Alternative. However, the severity of those impacts is expected to be much greater initially, but of shorter duration. This alternative would make any attempts to mitigate loss or disturbance of aquatic/riparian habitat and/or deterioration of water quality unfeasible.

4. Company Transportation/Access Proposal

Road construction up Alpine Gulch will have long-term adverse impacts on aquatic and riparian habitat quality, as well as water quality. These impacts resulting from the construction phase, maintenance and untilization of the road are also anticipated to affect Henson Creek, as well as part of the East Fork of Alpine Gulch. Through the lower one mile of Alpine Gulch, the stream will be channelized and portions of the riparian habitat will be permanently removed. Channelization of the stream will result in a loss or reduction of spawning and rearing habitat for resident populations of trout species within this system, as well as habitat that is available to migrants from Henson Creek. Alteration of this portion of the channel will reduce the numbers and diversity of aquatic inverterbrates, thus impacting the food source for the various aquatic and semi-aquatic species that inhabit this region. Additional impacts resulting from road construction are associated with siltation and sedimentation, changes in the natural meander of the stream, and the loss of cover. The removal or disturbance of riparian vegetation along the stream coupled with channelization will result in: 1) a reduction in organic material necessary to sustain aquatic life; 2) a loss of the vegetative canopy which provides thermal stability resulting in an increase in average annual stream temperatures; 3) the removal of overhanging vegetation which provides protection from predation and critical habitat for aquatic insect adults; 4) a loss of fish food organisms in the form of various terrestrial insects that inhabit streambank vegetation; 5) an increase in bank instability and, 6) a loss of the "buffering" effects considered an integral function of a healthy riparian zone. Siltation and sedimentation from road construction are expected to have relatively short-term impacts on the system. However, road maintenance and use during rainy spells would cause long-term impacts on the aquatic habitat of Alpine Gulch and Henson Creek.

The use of a "Tube Express" in transporting ore materials from the mining site to the millsite is expected to have short-term impacts. These impacts would be those associated with the construction phase and are covered above under the impacts related to road construction. Once the Tube Express is in place, there should only be minimal impacts associated with its operation in the vicinity of Alpine Gulch. The "Cow Creek route" would be expected to have the greatest adverse impacts of the two proposed routes. This is due primarily to the proximity of the tube express to Henson Creek and the number of drainages involved. The impacts of this route on the water and aquatic/riparian habitat quality are expected to be most noticeable during the construction phase and should be short-term in duration. Additional impacts will depend on the need for maintenance of this system over a period of time.

5. Alpine Gulch Haul Road Alternative

A road down Alpine Gulch large enough to function as a haul road for transport of ore to a railhead north of Lake City would have severe long-term impacts on the water quality, aquatic/riparian habitat quality and fishery of Alpine Gulch (including East Fork) and portions of Henson Creek. In addition to the impacts on the stream system, a larger portion of riparian habitat would be removed, making this approach the least desireable in terms of resource protection. It is expected that the severity of the impacts associated with this proposal would be approximately double those mentioned under the Company Transportation/ Access Proposal.

6. Wade Gulch Access Alternative

Although Wade Gulch has some good aquatic/riparian habitat, an access road up this drainage would cause impacts only where it becomes necessary to reroute from the existing road or extend it. These impacts are anticipated to be short-term and may be mitigated by working with construction personnel to develop the least impacting methods. Impacts associated with the methods of transporting ore via tram or conveyor would be expected to be similar to the use of a Tube Express.

7. Red Mountain Gulch Access Alternative

Of the three proposed alternative routes, an access road up Red Mountain Gulch would be expected to have the least impact on physical parameters of the area's aquatic/riparian resources. Some additional sediment load may occur in that portion of the Lake Fork between Red Mountain Gulch and Lake San Cristobal. These impacts are expected to be minimal since the proposed access route would cover an existing road and new road construction would occur above Red Mountain Gulch. The transport systems are covered under the Company's Transportation Proposal and the Wade Gulch Access Alternative.

Mitigation

The following comments are offered as mitigative measures that may be considered to reduce some of the anticipated impacts associated with this proposal and the alternatives.

1) Remove all ore and have no stockpiling.

2) Design all access roads through areas outside the aquatic/riparian habitat and use bridges where it becomes necessary to cross drainages.

3) Design the tube express in a manner that will span the more important aquatic and riparian areas and reclaim any roads needed for construction of the Tube Express, trams or conveyors.

4) Design roads to utilize "bench" areas in the fullest extent to avoid channelizing drainages.

5) Incorporate habitat improvement methods into the overall plan.

6) Begin monitoring the biological parameters at least 2 years prior to any activities. This will allow for baseline data to be collected for

determining changes in aquatic/riparian habitat quality. The monitoring should continue for life of mining operation.

Recreation

1. Company's Mining Proposal

Impacts will occur to recreation activities and opportunities under these mining operation alternatives. Some displacement of visitor use, (i.e. day hiking, backpacking, mountain climbing, and hunting) will occur, however, opportunities for these activities are as good in the adjacent areas. There will be little or no alteration or change in the primary scenic vehicle recreation activity.

Impacts to primitive types of recreation use, which are wildland resource oriented, will be heavily impacted by the physical land disturbance and noise pollution from the mining operations. Directly, these impacts would adversely affect uses in the Alpine Gulch drainage basin, which is geographically the center of the Redcloud Peak WSA. Indirectly, the physical scarring of Red Mountain could reduce the expansive wilderness views from the adjacent Big Blue Wilderness Area administered by the U.S. Forest Service. Red Mountain is very visible from many of the peaks and mountain passes within the 97,350 acre Big Blue Wilderness. In addition, views from the Powderhorn Primitive Area would be affected by mining operations on Red Mountain and thus could alter the recreational visitor's wilderness experience.

2. Strip Mining Alternative

Under this alternative, impacts to the recreation resource would be essentially the same as those described in the Company's Mining Alternative.

3. Accelerated Production Alternative

(Same as Alternative #1 above)

4. Company's Transportation/Access Proposal

This alternative would create a considerable amount of traffic congestion on Henson Creek (BLM Transportation Plan Road Number 3300) which is already receiving heavy use. The road located along Henson Creek lies at the bottom of a steep rocky drainage. Major road relocation might be needed before the addition of even service vehicles could be accomodated. New road construction in Alpine Gulch would present a safety hazard to the visiting public. These conflicts would occur because visitors to the area like to "explore new places". Visitors come to this area, to drive their recreational vehicles. This means exploring all open roads and 4-wheel drive type roads.

Construction of an access road and Tube Express in Alpine Gulch could adversely affect the fishing and access for fishing along Henson Creek near the mouth of Alpine Gulch.

Relocation of the trail would destroy the opportunities for solitude and unconfined recreation activities afforded to the visitor now. Any new road construction, utility corridor, or service road would completely eliminate the opportunity for solitude which the trail offers now.

Any disturbance in Alpine Gulch drainage area would completely eliminate the trail setting as it exists now.

The diversity of recreation opportunity settings will be altered by the proposal. The proposal would serve to reduce the wide variety of recreation experiences which can be achieved in this area. It is significant that 32% of the Redcloud WSA currently provides recreation opportunities in the primitive recreation opportunity class (refer to Appendix 4.5 in the Gunnison Basin and American Flats/Silverton Wilderness Environmental Statement). The Redcloud WSA also provides for semi-primitive, non-motorized recreation opportunities in 55% of its area.

Currently the Redcloud Peak WSA is the only WSA in the area which exhibits the primitive recreation opportunity class; that is, an area in which the potential wilderness user can achieve experiences associated with the most pure forms of wilderness recreation (e.g., challenge, risk-taking, isolation, necessity to utilize outdoor skills with a high degree of interaction with the natural environment).

This alternative completely eliminates the primitive and semi-primitive, non-motorized recreation opportunity settings discussed above. An area exhibiting a fuller range of recreation opportunity settings (from roaded natural to primitive) is most desirable in terms of providing managers the greatest latitude in exercising different options for managing the wilderness resource and its use. Therefore, not only will the recreation users lose those opportunities to; achieve the types of experiences available in primitive and semi-primitive, non-motorized settings, but management options to provide for these type experiences are also eliminated.

5. Alpine Gulch Haul Road Alternative

The recreation impacts from this alternative are basically the same as Alternative 1. The impacts to the Henson Creek drainage west of Alpine Gulch would be eliminated. The increases in traffic east of Alpine Gulch generated by haul and service vehicles would create a greater safety hazard to recreationist in the area due to concentrated use. This increased use would probably eliminate fishing activities along Henson Creek from Alpine Gulch to Lake City.

6. Wade Gulch Access Alternative

The Wade Gulch access alternative is the least impacting of the Transportation and Access Alternatives as it relates to recreation. This alternative would upgrade an existing road system allowing for development in an already disturbed area. If all development were kept in this area, impacts to Alpine Gulch and Henson Creek would be minimal. Conflicts would occur between off-road vehicles and mine equipment.

Off-road vehicle use would have to be controlled to provide visitor safety.

7. Red Mountain Gulch Access Alternative

The impacts in the Red Mountain Gulch alternative are very much like the Wade Gulch alternative impacts. Some of the heavy traffic congestion associated with Alpine Gulch Haul Road alternative would be eliminated.

Mitigation

Listed below are mitigating measures that might be considered to reduce some of the impacts associated with the proposal and alternatives.

Pull-outs should be provided for fishermen and sight-seers along Henson Creek for visitor safety and convenience, or service and haul roads could be constructed out of the canyon along Henson Creek.

J. Cultural

The mining, stockpiling, and transportation of the ore as well as the ancillary activities proposed would affect the cultural values that may be in the lease area. Direct surface disturbance will damage or destroy historic and prehistoric sites which may be present in the lease area.

The adverse effect of the action can be mitigated by following established procedures and guidelines outlined in the BLM 8111 Manual and in 36 CFR 800. Opportunities for comment on the potential effect on the cultural values will be given to the State Historic Preservation Officer and as appropriate the Advisory Council on Historic Preservation.

The lease area should be inventoried at a Class III (100% intensive) level prior to any surface disturbance. Slopes in excess of 20% only require an ocular reconnaissance if no historic or prehistoric sites are found. If cultural values are located they will be assessed for their significance and an appropriate mitigation plan developed in consultation with the SHPO and ACHP for those resources that will be effected by the proposed action.

All procedures of the Colorado BLM Guidelines for inventory, the BLM 8111 Manual, and 36 CFR 800 will be followed in developing appropriate mitigation measures.

K. Visual/Noise

1. Visual Resources (Refer to Map 7)

a. Company's Mine Proposal Alternative

The mine method proposed would create a flat ridge top with a steep, terraced receeding working wall. The new contours would be straight and parallel. Visual contrast would be high, mainly from the rectilinear working wall configuration. Impact would initially be to views from the south. As the mine proceeds, exposure of the high contrast area would increase to include views from the west and eventually the north. Views from the east would be affected if the eastern part of the mountain is eventually mined. Lights from the mine would be clearly visable at night in many locations.

NOISE AND VISUAL

MAP 7

b. Strip Mine Alternative

The mine would create furrowed strips across the ridge, following a sequence similar to the companys proposal. The entire outcrop area would be mined. The side facing Lake City would be mined about 100 years after the startup date. There would be no impact to the stockpile area. Night lights would be visable in many locations.

c. Accelerated Production Alternative

This alternative would utilize terraces over the entire outcrop area from the beginning, possibly affecting views from all directions in the initial stages. Visual contrast would be similar to the companys proposal. There would be no impact to the stockpile area. Night lights would be visable in many locations.

Stockpile Area

The stockpile would fill the narrow, nearly v-shaped headwater valleys of Alpine Gulch. Their assumed new form would be an increasingly high bench with a steep, terraced headwall defined by straight contours. Some evergreen woodland would be replaced by bare rock. Visual contrast with natural landforms would be highly noticeable, mainly from the new form and straight contours.

Mine Service Area

This 10 acre area would be a large flat bench carved into a steep slope below the main divide, in a narrow head valley of Alpine Gulch. The cut and fills would be very steep and formed by straight, parallel contours. Some low growing alpine vegetation would be replaced by bare rock, and a structural complex would be built to allow processing, maintenance, administrative and support functions.

Visual contrast would be high, mainly from the new rectilinear forms and lines. The preliminary plot plan shows poor visual quality in layout or grouping of functions.

Ore Transportation

Company's Access/Transportation Alternative

The proposed double tube line could require construction of a parallel permanent access road. Cuts and fills could vary and reach heights over 10 feet. Vegetation would be cleared in a strip about 60' wide. Visual contrast with natural landform and vegetation will vary from low to high. The lines caused by the edges of the disturbance are likely to be the most noticeable. The powerline would display sharp structural contrast but could be largely absorbed by the landscape.

Alpine Gulch Haul Road Alternative

The haul road would cause substantial cuts and fills and a wide running surface with a gentle grade. A 100' wide strip would be cleared of all vegetation types. Visual contrast would be high, mainly from the sharp cut

and fill lines exposed ground and vegetation clearing edges. The powerline would display sharp structural contrast.

Wade Gulch Access

The access road will require significant cuts and fills, with vegetation clearing averaging 60' in width. Visual contrast would vary, with the clearcut strip and exposed ground surface being the most prominent. The powerline would be noticeable and display sharp structural contrast, but will be largely absorbed by the natural landscape texture.

Red Mountain Gulch Alternative

The cuts, fills and vegetation clearing would be similar to those of the Wade Gulch Alternative. The powerline would be routed along Alpine Gulch or Wade Gulch. Visual contrast would vary, with the highest occurring in the densely wooded slopes.

No Action Alternative

There would be no modifications to any landscape feature from this alternative, thus there would be no impact.

Design Mitigation

1) Minimize visibility of working faces and structures from key viewing areas.

2) Utilize curvilinear contours to define the mine working faces, terraces and othe landform modifications.

3) Maintain a horizontal, rounded character in new ridgelines seen from key viewing areas.

4) Cover the sharp terrace lines with a uniform graded rock layer to natural talus slopes.

5) Vary the cut slopes on transportation routes to meet the existing grade within the shortest horizontal distance to minimize width of disturbance.

6) Randomize vegetation elements at edge of clearings to diffuse contrast.

7) Revegetate old road scars and new disturbance areas.

8) Use natural stone or wood exterior finish on structures; or paint with native earth hues of similar chrome.

9) Maintain dense vegetative or landform buffer along transportation routes in Henson Creek and through Lake City.

2. Noise (Refer to Map 7)

Noise levels were projected for each of the mine and transportation alternatives in order to determine the overall change in ambient noise levels and ascertain if significant noise impact would occur. The projected levels were compared with thresholds identified by EPA as required to protect public health and welfare to determine if adverse impact would occur.

The levels are related to the average long-term exposure in residential areas leading to annoyance reactions and complaints, and the detrimental effects of occupational noise on hearing. Since no level has been identified to protect primitive recreation activities from interference, the ambient level was assumed to be the base level. A change of over 6 dB was considered to be significant. Potential adverse impact would occur whenever the EPA threshold to protect hearing was exceeded; although the public would not be exposed for long enough to present a problem, the mine workers would be risking hearing loss. A summary of the areas affected and associated noise impacts follows:

Company's Mining Proposal Alternative

The projected noise level from the company's mine proposal is based on the combined emissions from front loaders, bulldozers and haul trucks in the pit areas; ore crushers and maintenance activity in the service area; and hual trucks, bulldozers in the ore storage area. The increase in ambient noise would be substantial, posing a risk of hearing loss within 1600 feet of the mine, covering about 184 acres. Activity interference with primitive recreation would occur up to 1.2 miles possibly affecting 2954 acres, not accounting for terrain and atmospheric influence on sound wave propogation, which could increase or decrease this range depending on the conditions. The layout proposed would reflect emissions towards the Red Cloud and Sunshine peaks. Due to the uncertainty of blasting requirements to loosen the ore at the pit, this assessment does not address those impacts, but they are expected to be major regardless of the level of activity.

Strip Mine alternative

The anticipated noise impact of this alternative would be similar to the company's proposal. The main difference is the propagation pattern. Working areas would be more exposed, and potentialyl radiate emissions in all directions, rather than reflect them toward Red Cloud Peak. The significant sources would be at the mine and service area. The ore storage area woud not emit noise but would be affected by emissions from the mine and service area.

Accelerated Production Alternative

The increased level of ore moving and processing activity would produce an audible increase over the noise of the other alternatives, but the impacts would be similar.

Transportation Alternatives

Company's Transportation/Access Alternative: the projected noise from the tube transporter and personnel access would result in a moderate increase in ambient sound levels. There would be no potential hearing loss hazard, but interference with primitive recreation could occur along a 400 foot wide corridor affecting about 100 acres along the route in Alpine Gulch. Impact along Henson Creek, the Lake Fork and Lake City would be insignificant during the summer, but may annoy some residents near the route, especially at night and during the winter.

Alpine Gulch Haul Road Alternative: this alternative would result in an increase in ambient sound levels along the route. A potential hearing hazard would occur within an 800' wide corridor affecting about 700 acres, and interfere with primitive and other recreation activity, and residential activity along a 1.2 mile wide corridor affecting about 5000 acres along the route. Night time levels would not be affected.

Wade Gulch Alternative: this alternative would result in an audible increase in ambient noise levels, but is not expected to be significant. It may interfere with primitive recreation activity during shift changes within 800 feet from the route, affecting about 400 acres.

Red Mountain Gulch: noise impact of this alternative would be similar to that of the Wade Gulch Alternative.

No Action Alternative: there would be no change in the ambient noise levels in any of the areas.

NOISE MITIGATION

Undoubtedly the mine operation would produce considerable noise impact, which can be somewhat mitigated by minimizing the emissions at the source, or reducing exposure of the public to the noise.

Lease stipulations to bind the lessee to noise abatement should include the provisions outlined below:

1. limitations could be developed on noise emissions in terms of threshol levels and timing, to minimize the impacts.

2. the mine operator shall use methods and devices as listed below to accomplish attenuation of noise from equipment and sites affected by the operations.

   a. mufflers in all internal combustion engine exhausts
   b. pneumatic tools and devices including drills shall have air exhaust mufflers
   c. locate sources and operation sites to block or reduce propagation of sould waves

3. the lessee shall monitor and report to BLM noise levels from the operation, and use the number of complaints as a measure of effectiveness of noise abatement programs.

L. Socio-Economics

1. No Action Alternative

Under this alternative Hinsdale County would continue to be highly dependent upon tourism. Table IV-5 shows population, school age population, employment and per capita income over the years 1983, 1984, 1990, 1997 and 2003 2/.

Table IV-5

Hinsdale County Projections No Mine 2/

	Population	School Age Population	Employment	Per capita Income 1982 Dollars $
1983	396	74	161	8021
1984	400	74	166	8225
1990	445	74	198	9100
1997	502	77	239	9896
2003	561	79	279	10513

Population

Population projections show Hinsdale County growing from a resident population of 389 in 1982 to 561 by the year 2003. School age population is expected to decrease to 14 percent (79 persons).

The tourist and summer resident population is projected to continue to grow through the year 2003. No accurate estimate of the rate of growth is possible at this time. If current growth trends continue however, a summer peak population of 7-8 thousand with a monthly mean of 4800 are the best estimates although not particularly reliable.

Employment

Employment levels are projected to rise to 279 by 2003. Employment will continue to be substantially tourist related with continued high numbers of government and construction industry jobs.

Per Capita Income

Per capita income will rise to $10,513 by the year 2003 driven by continued growth in the tourist industry.

Infrastructure

Considerable expenditure will be necessary to upgrade and expand infrastructural facilities. Creative taxation will be necessary in order to shift some of the burden of paying for these facilities from residents to the expanded summer population. Hinsdale County may find it necessary to restrict growth in tourist related business if infrastructural facilities cannot be upgraded due to insufficient funding. Current sales and property taxes are not at their highest legal levels, and it thus appears that some additional money is at least potentially available for needed facility upgrading and expansion 5/.

2. Company's Mine Proposal

Under this alternative the economy of Hinsdale County would be diversified by mine employment. Per capita income would rise but potential loss of tourism and vulnerability from mine closure would dilute this benefit.

Table IV-6 shows resident population, school age population, employment, and per capita income for this alternative over the years 1983, 1984, 1990, 1997, and 2003 2/.

Table IV-6
Hinsdale County Projections 70 Mine Workers 2/

	Population	School Age Population	Employment	Per capita Income 1982 Dollars
1983	396	74	161	8021
1984	453	87	189	8588
1990	633	119	307	11216
1997	675	119	349	11995
2003	724	119	389	12532

Population

The 2003 Hinsdale County resident population is projected to be 724, 29 percent greater than under the No-Action Alternative. School age population would rise to 119, a 50 percent increase over the No Action Alternative.

Employment

In addition to the tourist based economy, 100 construction workers would be employed from an arbitrary mine start date of 1984 until 1990. 23 of these construction workers are projected to be residents of Hinsdale County. Six years after the mine begins operation, production should begin (assigned here an arbatrary date of 1990). 70 miners would be employed permanently from this date while the construction workers would either leave the area or seek other employment. The 70 permanent mine jobs would ultimately be responsible for the employment level under this alternative being 109 jobs greater (39 percent higher) than under the No-Action Alternative in 2003.

Per Capita Income

Per capita income is projected to rise to $12,532 by the year 2003, nineteen percent over the No-Action Alternative.

Infrastructure

Because of the increased rise in resident population, infrastructural facilities would require considerable expansion and upgrading prior to and during the construction phase of the mine. Financing these requirements may be expected to place a major burden on the community. Funding the needed upgrading and expansion would require higher property and sales taxes as well as considerable financial aid from both the state and the mining company. Hinsdale County is likely to experience considerable political upheavel over these funding issues.

Loss of Tourism

Substantial probability exists that mining in the Hinsdale County area could reduce levels of tourism and as a consequence effect the population and economy of the county. Table IV-7 shows the effects of losing 10, 25, and 50 percent of Hinsdale County tourism on resident population, employment and per capita income in 1990 (Appendix I). No accurate projection can be made of actual loss of tourism without extensive further study.

No attempt has been made to assess the potential loss of the summer resident population. There is some indication that this population may be very prone to abandon Hinsdale County if a mine deminished the esthetic qualtiy of the area. Further study will be necessary to establish the projected loss of this segment of the population and the economic consequences of this loss.

Table IV-7
1990 Results of Mine Induced Loss of Tourism Appendix I

Percent Tourism Loss	Population	Employment	Per Capita Income 1982 Dollars
No Loss	633	307	11216
10%	604	294	11323
25%	561	275	11494
50%	490	243	11830
No-Action Alt.	445	198	9100

As tourism decreases, table IV-7 shows decreasing levels of population and employment but a rise in per capita income. Per capita income may be expected to rise if the population loss occurs at a faster rate than the income loss. This is not unexpected in Hinsdale County as relatively low paid tourist dependent people leave the county while high income mine employees remain.

Mine Closure

A loss of tourism would become much more serious in the event of temporary or permanent mine closure. The effect of a 1990 mine closure, given a 10, 25, and 50 percent tourist loss is presented in Table IV-8 (Appendix I).

Table IV-8
1990 Results of Mine Closure and Mine Induced Loss of Tourism Appendix I

Percent Tourism Loss	Population	Employment	Per Capita Income 1982 Dollars
Mine Closure	633	198	6397
10%	604	185	6273
25%	561	166	6057
50%	490	134	5605
No Action Alt.	445	198	9100

Table IV-8 shows a substantial loss in per capita income, and employment in the event of a mine closure. Mine related loss of tourism appears to intensify the effect of mine closure as per capita income and employment fall still further. Long run population loss may be expected as income becomes insufficient to support marginal residents. The tax base necessary to support past expenditures for infrastructural improvement would be greatly eroded, causing extreme financial difficulties for the Hinsdale County Government.

Socio-economic impacts from the Strip Mine Alternative would be the same as from the Company's Mining Proposal.

3. Accelerated Production Alternative

Under this alternative the economy of Hinsdale County would become highly dependent on mine employment. Per capita income would rise but potential loss of tourism and great vulnerability from mine closure would dilute this benefit.

Table IV-9 shows population, school age population, employment and per capita income for this alternative over the years 1983, 1984, 1990, 1997 and 2003 2/.

Table IV-9
Hinsdale County Projections 105 Mine Workers 2/

	Population	School Age Population	Employment	Per capita Income 1982 Dollars
1983	396	74	161	8021
1984	453	87	189	8588
1990	718	139	362	12002
1997	762	140	404	12655
2003	809	140	444	13164

Population

The 2003 Hinsdale County resident population is projected to be 809, 49 percent greater than under the No-Action Alternative. School age population would rise to 140 a 77 percent increase over the No-Action Alternative.

Employment

105 Mine workers would be employed permanently starting from 1990. The 105 mine jobs would ultimately be responsible for the employment level under this alternative being 165 jobs greater (59 percent higher) than under the No-Action Alternative.

Per Capita Income

Per capita income would be expected to rise to $13,164 by the year 2003, a 25 percent rise over the No-Action Alternative.

Infrastructure

See Company's Mining Proposal.

Loss of Tourism

See discussion under Company's Mining Proposal.

Table IV-10 shows the effects of losing 10, 25, and 50 percent of Hinsdale County Tourism on resident population, employment, and per capita income in 1990 (Appendix I).

Table IV-10
1990 Results of Mine Induced Loss of Tourism Appendix II

Percent Tourism Loss	Population	Employment	Per Capita Income
No Loss	718	362	12002
10%	684	349	12141
25%	646	330	12344
50%	575	298	12735
No Action Alt.	445	198	9100

Mine Closure

See discussion under Company's Mining Proposal.

The effect of a 1990 mine closure given a 10, 25, and 50 percent tourist loss is presented in Table IV-11.

Table I1
1990 Results of Mine Closure and Mine Induced Loss of Tourism Appendix I

Percent Tourist Loss	Population	Employment	Per Capita Income 1982 Dollars
No Loss	718	198	5640
10%	689	185	5499
25%	646	166	5260
50%	575	134	4776
No Action Alt.	445	198	9100

The results of mine closure are dramatic and drastic under this alternative. Per capita income and employment would fall dramatically with longer term expectations of greatly reduced population levels. The tax base necessary to pay for past infrastructural expansion would be greatly eroded, causing extreme financial difficulties for the Hinsdale County government.

Transportation Alternatives

Changes in transportation access have no measurable socio-economic effects on the area.

M. Wilderness

Mining

Company's Mining Proposal Alternative

Under this alternative, as proposed by Earth Sciences, approximately one-fourth of the Redcloud Peak WSA would be adversely affected either directly or indirectly by the mining activity and transportation/access routes in the extraction of the alunite. It is proposed that approximately 812 acres of the land will be disturbed after 104 years of mining. In addition, due to transportation routes (i.e. roads) it is estimated that approximately 7,000 acres would be eliminated from the potential wilderness resource.

The mining and associated activities could adversely affect several of the resource values which are benefited by the wilderness resource within the remainder of the WSA. Primitive recreation and outstanding opportunities for solitude could be reduced substantially within the basin of Alpine Gulch as well as on the high peaks and ridges within the Redcloud Peak WSA. The use of mechanized equipment and visual degradation of the natural landscape could substantially alter the primitive recreational use and activity within the eastern half of the WSA. (See Map #8)

Many of the special features of the WSA; including the wildlife, watershed, soils, and vegetation, would be disrupted or destroyed within the eastern portion of the WSA. Visual intrusions, noise pollution, and stress on the wildlife could also adversely affect other large portions of the WSA; especially in Alpine Gulch and the higher peaks and ridges.

Mining activities on Red Mountain, would also be visible from the nearby Big Blue Wilderness Area. These views, and the subsequent wilderness experience of the users, would be adversely impaired in portions of the Big Blue Wilderness.

Strip Mine Alternative

Under this alternative, as it relates to the wilderness resource, the impacts would be essentially the same as those described under the Company's Mining Proposal.

Accelerated Production Alternative

Under this alternative, as it relates to the wilderness resource, the impacts would be essentially the same as those described under the Company's Mining Proposal.

——— Lease Application Area Boundary
———- Wilderness Study Area Boundary

Map 8. Portion of Red Cloud Peak WSA

Transportation/Access

Company's Transportation/Access Proposal Alternative

As described under the Company's Mining Proposal, approximately one-fourth of the Redcloud Peak WSA would be adversely affected either directly or indirectly by the mining activity and transportation/access routes in the extraction of the alunite (see discussion above under Company's Mining Proposal.

Alpine Gulch Haul Road Alternative

Under this alternative, as it relates to the wilderness resource, the impacts would be essentially the same as those described under the Company's Access Alternative.

Wade Gulch Access Alternative

Under this alternative, some direct and indirect impacts to the wilderness resource would be reduced; especially to the area within Alpine Gulch. Although the impacts due to mining would continue, this alternative would allow primitive means of travel (foot/horse) to continue in Alpine Gulch which provides access into the heart of the Redcloud Peak WSA. Under this alternative, approximately 2,500 acres or less could conceivably be added to those lands within the Redcloud Peak WSA originally recommended suitable for wilderness designation (Gunnison Basin and American Flats - Silverton Wilderness Preliminary Final Environmental Impact Statement and Study Report).

Red Mountain Gulch Access Alternative

Under this alternative, as it relates to the wilderness resource, the impacts would be essentially the same as those described under the Wade Gulch Access Alternative.

Mitigation

With the exception of a transportation/access route in either Wade Gulch or Red Mountain Gulch, there is no possible mitigation. Any mining activities will essentially remove this eastern portion of the Redcloud Peak WSA from further consideration as a wilderness resource. Any decision to mine would be a negative impact on the wilderness resource.

V. Consultation and Coordination

The following agencies, groups and individuals were consulted or otherwise supplied comments which were considered in this analysis:

Hinsdale County Board of Commissioners

Lake City Town Council

Region 10 Planning Commission

Forest Supervisor, Grand Mesa, Uncompahgre, Gunnison National Forests

Colorado Division of Wildlife

Colorado Open Space Council

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APPENDIX I

Loss of Tourism Equations

Total Effect of Tourism on Income	=	(Travel Generated 5*/) (Payroll)	x	(Basic Income 2/) (Multiplier)
Income Loss Due To Tourist Loss	=	(Percent Tourist) (Loss)	x	(Total Effect of) (Tourism on Income)

1 Employment

Average Income Per Job	=	(Total Personal Income) (No Action(2/)	-	(Employment Level) (No Action 2/)
Employment Loss Due To Lost Tourism	=	(Income Loss Due) (To Tourist Loss)	-	(Average Income) (Per Job)
Employment Level With Tourist Loss	=	(Employment Level 2/) (Alternative)	-	(Employment Loss Due) (To Lost Tourism)

2 Population

Population Loss Due To Tourist Loss	=	(Income Loss Due) (To Tourist Lost)	-	(Per Capita Income) (No Action) 2/)
Population With Tourist Loss	=	(Population Level 2/) (Alternative)	-	(Population Loss) (Due To Tourist Loss)

3 Per Capita Income

Total Personal Income After Tourist Loss	=	(Total Personal 2/) (Income Alternative)	-	(Income Loss Due To) (Tourist Loss)
Per Capita Income With Tourist Loss	=	(Total Personal Income) (After Tourist Loss)	-	(Population)

Appendix II

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Appendix III

Glossary

Interflow - water which infiltrates into the land surface and moves laterally above the water table, until it enters a stream channel.

Sediment yield - the total amount of suspended solids transported past a defined drainage basin outlet from all fluvial erosion sources.

Intermittent stream - A stream that flows for at least one month but not year-long, as a result of groundwater discharge or surface runoff.

Perennial stream - a stream that flows throughout the year and from source to mouth.

☆ United States Government Printing Office: 1983-680-144